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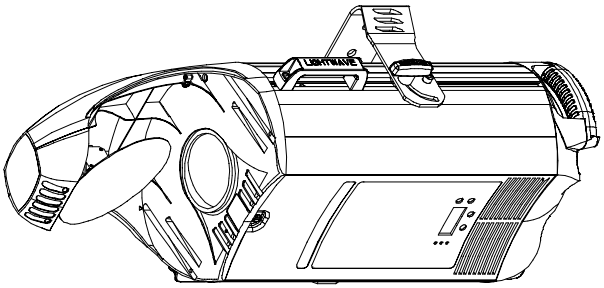
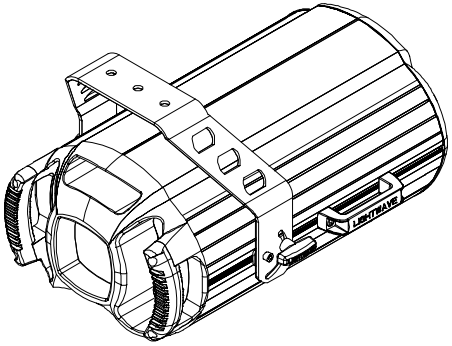
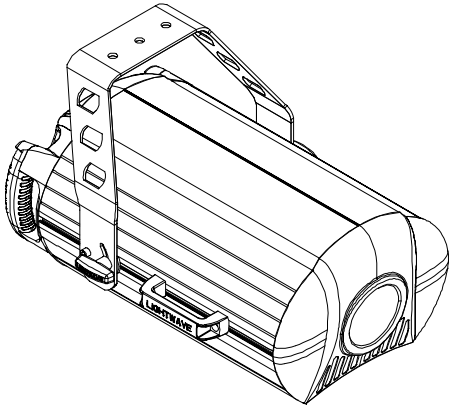
TECHNOPRO™
TECHNORAY™







User Manual

High End Systems, Inc.
2217 West Braker Lane
Austin, TX 78758 U.S.A.

LIGHTWAVE RESEARCH®

p/n 60600115 Version 1.1

TECHNOBEAM™
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User Manual

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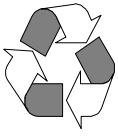
Technobeam User Manual
P/N 60600115 Version 1.1 March 1998

Printed in the U.S.A.



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Technobeam, Technoray or Technopro may use one or more of the following patents: US 4,962,687; US 5,078,039; UK 2,043,769; US 5,331,822; US 5,402,326; US D 372550; UK 2292896; US D365165; US 5,430,629; US D360,404; US 5,455,748; 0475082; US 5,506,762; M9604224.9; US 5,515,254; US D370080; UK 2.291,814; US 5,545.951; UK 2055842; UK 2,292,530; UK 2294909; UK 2292896; MR 8621996; and US 5,580,164.

Additional patents pending.

Declaration of Conformity

according to ISO/IEC Guide 22 and EN45104

Manufacturer's name:	Lightwave Research
Manufacturer's address:	2217 West Braker Lane Austin, Texas 78758 U.S.A.
Distributor's name:	High End Systems Inc.
Distributor's address:	2217 West Braker Lane Austin, Texas 78758 U.S.A.

Declares that the product

Product Name:	Technobeam
Product Number:	Technopro Technoray
Product Options:	All

conforms to the following EEC directives:
73/23/EEC, as amended by 93/68/EEC
89/336/EEC, as amended by 92/31/EEC and 93/68/EEC

Equipment referred to in this declaration of conformity first manufactured in 1997 in compliance with the following standards:

Safety:	EN 60598-1 : 1993
	EN 60598-2-17 : 1989 A1-A3 : 1993
	EN 60825-1, 1994
EMC:	EN 55022, Class A ITE
	IEC 801-2, 1991 Level 2 (4/8 kV)
	IEC 801-3, Draft 5 Level 2 (3 V/m)
	IEC 801-4, 1988 Level 2 (1 kV/0.5 kV)

U.S.A., February 27, 1998
Kenneth Stuart Hansen, Compliance Engineer

Important Safety Information

Instructions pertaining to continued protection against fire, electric shock, exposure to excessive ultraviolet (UV) radiation, and injury to persons are found in Appendix D.

Please read all instructions prior to assembly, mounting, and operating this equipment.

IMPORTANT: INFORMATIONS DE SÉCURITÉ
Les instructions se rapportant à la protection permanente contre les incendies, l'électrocution, l'exposition à un rayonnement ultraviolet (UV) excessif et aux blessures corporelles se trouvent dans l'Annexe D.

Veuillez lire toutes les instructions avant d'assembler, de monter ou d'utiliser cet équipement.

WICHTIGE SICHERHEITSHINWEISE
Sicherheitsanleitungen zum Schutz gegen Feuer, elektrischen Schlag, übermäßige UV-Strahlung und Verletzung von Personen finden Sie in Anhang D.

Vor der Montage, dem Zusammenbau und der Inbetriebnahme dieses Geräts alle Anleitungen sorgfältig durchlesen.

INFORMAZIONI IMPORTANTI DI SICUREZZA
Le istruzioni sulla protezione da incendi, folgorazione, esposizione eccessiva a raggi ultravioletti (UV) e infortuni sono contenute nell'appendice D.

Si prega di leggere tutte le istruzioni prima di assemblare, montare e azionare l'apparecchiatura.

INFORMACION IMPORTANTE DE SEGURIDAD
En el Apéndice D de este manual se encuentran instrucciones sobre protección continua contra incendios, descarga eléctrica, exposición excesiva a radiación ultravioleta (UV) y lesiones personales.

Lea, por favor, todas las instrucciones antes del ensamblaje, montaje y operación de este equipo.

Product Modification Warning

High End Systems products are designed and manufactured to meet the requirements of United States and International safety regulations. Modifications to the product could affect safety and render the product non-compliant to relevant safety standards.

Mise En Garde Contre La Modification Du Produit

Les produits High End Systems sont conçus et fabriqués conformément aux exigences des règlements internationaux de sécurité. Toute modification du produit peut entraîner sa non conformité aux normes de sécurité en vigueur.

Produktmodifikationswarnung

Design und Herstellung von High End Systemen entsprechen den Anforderungen der U.S.A. und den internationalen Sicherheitsvorschriften. Abänderungen dieses Produktes können dessen Sicherheit beeinträchtigen und u. U. gegen die diesbezüglichen Sicherheitsnormen verstoßen.

Avvertenza Sulla Modifica Del Prodotto

I prodotti di High End Systems sono stati progettati e fabbricati per soddisfare i requisiti delle normative di sicurezza statunitensi ed internazionali. Qualsiasi modifica al prodotto potrebbe pregiudicare la sicurezza e rendere il prodotto non conforme agli standard di sicurezza pertinenti.

Advertencia De Modificación Del Producto

Los productos de High End Systems están diseñados y fabricados para cumplir los requisitos de las reglamentaciones de seguridad de los Estados Unidos e internacionales. Las modificaciones al producto podrían afectar la seguridad y dejar al producto fuera de conformidad con las normas de seguridad relevantes.

FCC Information

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Warranty Information

Limited Warranty

Unless otherwise stated, your product is covered by a two (2) year parts and labor limited warranty. The Laser Aiming Device™ for Technobeam™ is covered by a six (6) month parts and labor limited warranty. Dichroic filters and LithoPatterns® high resolution glass gobos are not guaranteed against breakage or scratches to coating. It is the owner's responsibility to furnish receipts or invoices for verification of purchase, date, and dealer or distributor. If purchase date cannot be provided, date of manufacture will be used to determine warranty period.

Returning an Item Under Warranty for Repair

It is necessary to obtain a Return Material Authorization number (RMA#) from your dealer or point of purchase **BEFORE** any units are returned for repair. The manufacturer will make the final determination as to whether or not the unit is covered by warranty. Lamps are covered by the lamp manufacturer's warranty.

Any Product unit or parts returned to High End Systems must be packaged in a suitable manner to ensure the protection of such Product unit or parts, and such package shall be clearly and prominently marked to indicate that the package contains returned Product units or parts and with a Return Material Authorization (RMA#) number. Accompany all returned Product units or parts with a written explanation of the alleged problem or malfunction.

Please Note: Freight Damage Claims are invalid for fixtures shipped in non-factory boxes and packing materials.

Freight

All shipping will be paid by the purchaser. Items under warranty shall have return shipping paid by the manufacturer only in the Continental United States. **Under no circumstances will freight collect shipments be accepted.** Prepaid shipping does not include rush expediting such as air freight. Air freight can be sent customer collect in the Continental United States.

REPAIR OR REPLACEMENT AS PROVIDED FOR UNDER THIS WARRANTY IS THE EXCLUSIVE REMEDY OF THE CONSUMER. HIGH END SYSTEMS, INC. MAKES NO WARRANTIES, EXPRESS OR IMPLIED, WITH RESPECT TO ANY PRODUCT, AND HIGH END SPECIFICALLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. HIGH END SHALL NOT BE LIABLE FOR ANY INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGE, INCLUDING LOST PROFITS, SUSTAINED OR INCURRED IN CONNECTION WITH ANY PRODUCT OR CAUSED BY PRODUCT DEFECTS OR THE PARTIAL OR TOTAL FAILURE OF ANY PRODUCT REGARDLESS OF THE FORM OF ACTION, WHETHER IN CONTRACT, TORT (INCLUDING NEGLIGENCE), STRICT LIABILITY OR OTHERWISE, AND WHETHER OR NOT SUCH DAMAGE WERE FORESEEN OF UNFORESEEN.

Warranty is void if the product is misused, damaged, modified in any way, or for unauthorized repairs or parts. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

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Introduction

Congratulations on your purchase of the Technobeam™, Technopro™ or Technoray™ automated luminaire. Since 1989, High End Systems® has enjoyed a reputation within the professional lighting industry as the premier manufacturer of intelligent lighting. This tradition of excellence is carried forward with Technobeam, Technopro and Technoray.

For the first time ever, stunning light output and extended lamp life are combined with superior photolithographic image projection quality in a compact package destined to revolutionize intelligent lighting in retail, themed environment, entertainment, architectural and other applications.

The fixtures all have a factory-installed standard lens set with 11˚ to 17˚ beam angle, and an optional 8˚ to 12˚ narrow angle lens set. The luminaires' remote focus provides razor sharp beam or image projection at various trim heights and throw distances. As with all Lightwave Research® intelligent luminaires, Technobeam, Technopro and Technoray include remotely-controllable and programmable full optical dimming, fade-to-black, and variable-speed strobe effects.

(Technobeam™ has a mirror head with 180˚ pan and 95˚ tilt. Technopro and Technoray have static projection bezels.)

Features

Programming

- On-board eight scene memory for controller-free, stand-alone operation.
- High-resolution DMX 512 control, with optional reduced-channel protocols for Technobeam and Technoray.
- DMX 512 protocol and onboard programming each feature 28 fixture-specific *macros* (unique combinations of constructs) to simplify programming.

Optics and Effects

- Two-piece clear anodized elliptical/spherical reflector system (patent pending) delivers a remarkable (>50%) gain in light output compared with the elliptical reflectors used in other fixtures of this type.
- Factory-installed 11˚ to 17˚ lens set.
- Optional 8˚ to 12˚ narrow angle lens set.
- Technobeam only: 180˚ pan, 95˚ tilt.
- Technoray, Technobeam only:
  - 12 saturated dichroic colors—including a 3000K color correction filter—plus open position.
  - Rotating 8-position LithoPatterns® wheel features 7 replaceable positions plus open.
  - Optional static litho in each of the 7 replaceable rotating litho positions for layered moire and multi-focus effects.
- Technopro only:
  - One color wheel with 12 saturated dichroic colors—including a 3000K color correction filter—plus open position.
  - One color wheel with 7 mixing dichroic colors plus one open position.
  - A total of 104 color combinations possible.
- Effects wheel features five replaceable, rotating effects—including frost, lenticular, and hammered.
- Optional open slot at one or more effects positions.
- Improved flat field beam performance.

Note All beam angles are accurate to ±1˚.

Construction

- Lens tube, wheel gears, front and rear bezels manufactured from lightweight, rugged, engineering thermopolymer.
- Tough powder-coated aluminum side panels.
- Molded handles for easy transportation, lifting and mounting.

Lamp

Philips® M series, GX9.5 base 250-watt metal halide arc lamp providing 6500K stable operation and extended lamp life. The lamp can be remotely switched off, conserving approximately 70% of the power to the unit compared to the lamp being on.

Other features

- Remote focus
- Full dimming and fade-to-black
- Variable-speed strobe
- Yoke assembly features sliding track for mounting flexibility
- Available as standard in black or white
- Power factor correction
- Self-adjusting fan speed to compensate for ambient temperature conditions

Symbols

This section explains symbols used in this manual:

Appears adjacent to Caution messages. A Caution is an advisory provided to protect the equipment; failure to heed a Caution message could result in damage to the equipment and possibly injury to persons.

Appears adjacent to Electrical Shock hazards. Failure to heed these messages could result in injury to persons.

Appears adjacent to Explosion warnings. Failure to heed these messages could result in injury to persons.

Indicates that eye and hand protection is required. Failure to do so could result in injury to persons.

Document Conventions

Convention	Meaning
<key>	Menu keys are indicated between braces. For example, the <Enter> key on the fixture's key pad.
BOLD	**BOLD** type is used to indicate selections you make in the menu system.

Getting Help

U.S., the Americas and Europe	Service address: 2227 West Braker Lane Austin, TX 78758 U.S.A. From 8 a.m. to 6 p.m. (U.S. Central time) Monday through Friday: (800) 890-8989 24-hour FAX: (512) 834-9195 24-hour voice mail: (512) 837-3063 or (800) 890-8989 8200 Haskell Avenue Van Nuys, California 91406 Voice: (818) 947-0550 Fax: (818) 908-8975
Singapore	Voice:+65 742 8266 FAX:+65 743 9322
24-hour Customer Service World Wide Web site	http://info.highend.com/service/service.html
High End Systems World Wide Web site	http://www.highend.com

Chapter 1
Preparing to Install Your Fixture

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Specifications

This section lists specifications for Technobeam, Technopro and Technoray.

Model Numbers

Models:	Technobeam Technopro Technoray
Manufacturer:	Lightwave Research®
Distributor:	High End Systems, Inc. 2217 W. Braker Lane Austin, Texas, 78758 USA

Dimensions (with yoke and handles)

Technopro and Technoray:

in: 22 L x 13 H x 16 W
cm: 56 L x 33 H x 41 W

Technobeam:

in: 34 L x 13 H x 16 W
cm: 86 L x 33 H x 41 W

Note The height of all fixtures without the yoke is 9.6 in. (24 cm).

Weight (including yoke)

Technoray, Technopro: 39 lbs (18 kg)
Technobeam: 41 lbs (19 kg)

Electrical Specifications

- **Voltages:** 100/120/230 V; 50 Hz; 3.75/3.13/1.6 A
  100/120/208 V; 60 Hz; 3.75/3.13/1.8 A
- **Rated power:** 375 W
- **Power factor, 120V, 60 Hz:** 0.96
- **Power factor, 230V, 50 Hz:** 0.90
- **Fuses:**
  - **F1**—125V, 4.0A, Fast Blow Only (5mm x 20mm)
  - **F2**—250V, 2.5A, Fast Blow Only (5mm x 20mm)
  - **F3**—250V, 6.3A, Slow Blow Only (5mm x 20mm)

Class I equipment - This equipment must be earthed.

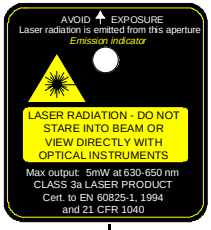
Technobeam™ Laser Aiming Device™ (LAD™)

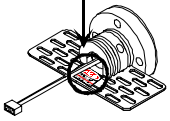
The specifications below apply *only* to Technobeam fixtures that have the Laser Aiming Device (LAD) installed.

- Class 3a laser product
- Beam divergence angle: 0.2mRad to 0.3mRad
- Maximum output (continuous): 5mW at 630-650nm
- Maximum output (pulsed): <2.5mW
- Pulse modulation: 4.25Hz to 255Hz @ 50% duty cycle
- Pulse duration: 1.96ms to 117ms
- Pulse energy: 9.8µJ to 585µJ

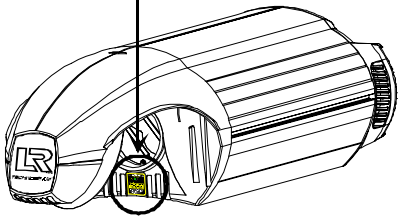
LAD Safety Standards

- EN60825-1, 1994
- 21 CFR 1040


AVOID EXPOSURE
Laser radiation is emitted from this aperture
Emission indicator
LASER RADIATION - DO NOT STARE INTO BEAM OR VIEW DIRECTLY WITH OPTICAL INSTRUMENTS
Max output: 5mW at 630-650 nm
CLASS 3a LASER PRODUCT
Cert. to EN 60825-1, 1994
and 21 CFR 1040



Laser aiming device assembly (inside fixture)



Important Power Cord Information - U.K. Only

IMPORTANT The cores in the mains lead are colored in accordance with the following code:

- **green and yellow:** earth
- **blue:** neutral
- **brown:** live

This equipment must be earthed.

Vigtig Sikkerhedsinformation - DANMARK

Advarsel: Beskyttelse mod elektrisk chock.

Vigtigt!

Lederen med gul/groen isolation maa kun tilsluttes en klemme maerket

eller

Dichroic, Litho and Effects Specifications

You can install any High End Systems-manufactured solid dichroic filters, effects LithoPatterns lithos, ArtGlass, or Fusion Fire®—as long as they were manufactured for use with Technobeam, Technopro or Technoray and not another fixture; otherwise, the dichroics, lithos or effects might not fit in the wheels properly.

You can also install gobos or lithos from other manufacturers as long as they adhere to the following specifications:

Dichroics

- Diameter: 1.2" ± 0.010" (30 mm ±0.25 mm)
- Thickness: 0.069" ± 0.010" (1.8 mm ±0.25 mm)

Lithos

- Diameter/image area: 0.996"/0.860" ± 0.005" (25 mm/22 mm ±0.13 mm)
- Maximum thickness (rotating litho only): 0.105" ± 0.005" (2.7 mm ±0.13 mm)
- Thickness (static litho only): 0.069" ± 0.010" (1.8 mm ±0.25 mm)

Rotating effects wheel

- Diameter/image area: 1.43"/1.04" ± 0.010" (36 mm/26 mm ±0.25 mm)
- Maximum thickness: 0.175" (4.4 mm)

Safety Standards

Technobeam, Technopro and Technoray conform to:

- EN 60598-1 : 1993
- EN 60598-2-17 : 1989
  A1-A3 : 1993
- ANSI/UL-1572
- CAN/CSA C22.2 No. 9

Electromagnetic Standards

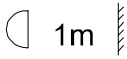
- EN 55022, Class A ITE
- IEC 801-2, 1991 Level 2 (4/8 kV)
- IEC 801-3, Draft 5 Level 2 (3 V/m)
- IEC 801-4, 1988 Level 2 (1 kV/0.5 kV)

ETL Listed
67501 Conforms to ANSI/UL-1572
Certified to CAN/CSA
C22.2 No. 9

CE

Environmental Specifications

Maximum ambient temperature (T_a):	50˚ C (122˚ F)
Maximum exterior surface temperature:	70˚ C (158˚ F)
Minimum distance to flammable objects:	1.0 m (3.28 ft)
Minimum distance to lighted object:	1.0 m (3.28 ft)



DMX Data Cabling

- **DMX data cables:** Belden® 9841 or equivalent (meets specifications for EIA RS-485 applications) with characteristics listed below:
  - 2-conductor, twisted pair plus a shield
  - maximum capacitance between conductors - 30 pF/ft.
  - maximum capacitance between conductor & shield - 55 pF/ft.
  - maximum resistance of 20 Ω/1000 ft.
  - nominal impedance 100–140 Ω
  - 22–24 AWG with insulation having a dielectric rating of 300 volts or higher
- **DMX data connectors:** 3-pin male and female XLR connectors
- **DMX data terminators:** Male XLR connector with 120 ohm terminator between pins 2 and 3 (see Figure 2-4 on page 2-6)

Controllers

Technobeam, Technopro or Technoray may be controlled with any of the following:

- The Status Cue® system.
- The Technobeam LCD controller (p/n 29020001)
- Another DMX 512-compatible controller.

Optional Accessories

Table 1-1 below shows the optional accessories for Technobeam, Technopro or Technoray available from your High End Systems® dealer/distributor:

Table 1-1. Optional Accessories

Name	Part Number
Optional lens sets	Call*
Replacement Philips M Series lamp	Call*
Custom color wheel dichroic filters	Call*
LithoPatterns	Call*
Effects	Call*
Technobeam LCD controller	29020001
Laser Aiming Device for Technobeam only†	29060002
Status Cue System	Call*
Heavy duty 3-pin XLR cable (10')	55050005
Heavy duty 3-pin XLR cable (25')	55050006
Heavy duty 3-pin XLR cable (50')	55050007
Heavy duty 3-pin XLR cable (100')	55050008
Deluxe C-clamp	55000004
Galvanized safety cable	12040001

† - You must obtain the Laser Aiming Device from High End Systems Customer Service; see "Getting Help" on page Intro-4

Call* - Contact either your High End Systems dealer/distributor, High End Systems Sales, or the High End Systems World Wide Web site.

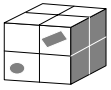
High End Systems Sales: See the inside title page of this manual.

High End Systems World Wide Web site: http://www.highend.com

Unpacking the Fixture

Unpack the Technobeam, Technopro or Technoray box and verify that the contents arrived complete and without any damage.

Save the Shipping Materials



Do not discard the shipping carton and packing materials. The carton and packing materials are specifically designed to protect the product during transport.

High End Systems, Inc. assumes no responsibility for products damaged during transport. Therefore, you should return a product for repair in its original shipping carton and packing materials.

Note Before sending anything to the factory, be sure to call your HES dealer/distributor for a Return Material Authorization (RMA) number. The factory cannot accept any goods shipped without an RMA number.

Inspecting the Contents

Carefully unpack the carton and inspect the contents for damage. If any items in the list below are missing or damaged you must notify both the shipping agent and your sales agent immediately.

- One Technobeam, Technopro or Technoray fixture.
- Separate yoke packaging: one yoke, two yoke slide bezels, two allen screws, two T-handles.

Installing the Power Cord Cap

IMPORTANT The cores in the mains lead are colored in accordance with the following code:

- **green and yellow:** earth
- **blue:** neutral
- **brown:** live

In some cases, you must obtain and install a power cord cap before you can connect your fixture to a power outlet. The type of power cord cap you must obtain depends on the location in which Technobeam, Technopro or Technoray will be used; different locations (even within the same country) might have different power cord cap requirements.

Note Because of the wide variety of power cord caps used worldwide, High End Systems, Inc. cannot make specific recommendations for the particular power cord cap you should use. Contact a local authority if you are unsure which type of power cord cap you need.

Important Power Cord Cap Information - U.K. Only

Since the colors of the cores in the mains lead of this equipment may not correspond with the colored markings identifying the terminals in your plug, proceed as follows:

- The core which is colored green and yellow must be connected to the terminal in the plug which is marked with the letter "E" or by the earth symbol ⏚, or colored green or green and yellow.
- The core which is colored blue must be connected to the terminal which is marked with the letter "N" or colored black.
- The core which is colored brown must be connected to the terminal which is marked with the letter "L" or colored red.

Class 1 equipment: This equipment must be earthed.

VIGTIG FIKKER HEDS INFORMATION - DANMARK

Advarsel: Beskyttelse mod elektrisk chock.

Vigtigt!
Lederne med gul/groen isolation maa kun tilsluttes en klemme maerket
eller

Installing the Yoke

You will need: one 1/4" allen wrench

This section explains how to install the moving-track yoke. You can adjust the yoke however you want to distribute the weight of the fixture. You can even slide the yoke all the way to the end of the fixture to hang it straight down.

1. Identify the components shown in Figure 1-1:

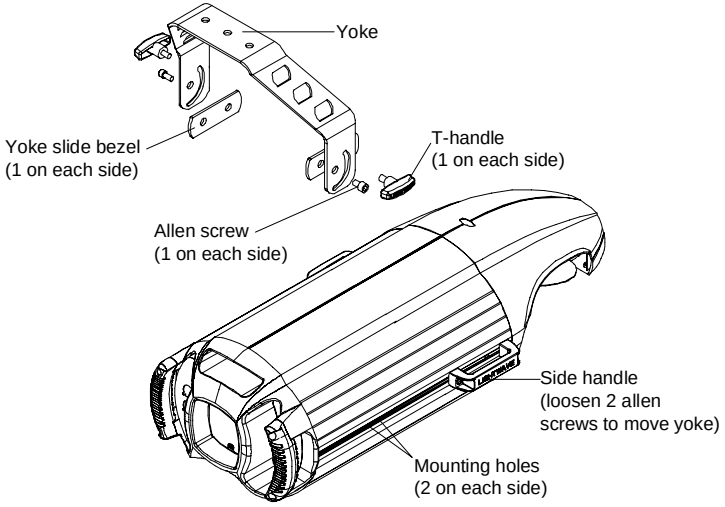


Figure 1-1. Identifying yoke components.

2. Use a 1/4" allen wrench to attach one allen screw to each side of the fixture (but do not fully tighten it), as shown in Figure 1-2. *Make sure you place a yoke slide bezel between the yoke and each side of the fixture.*

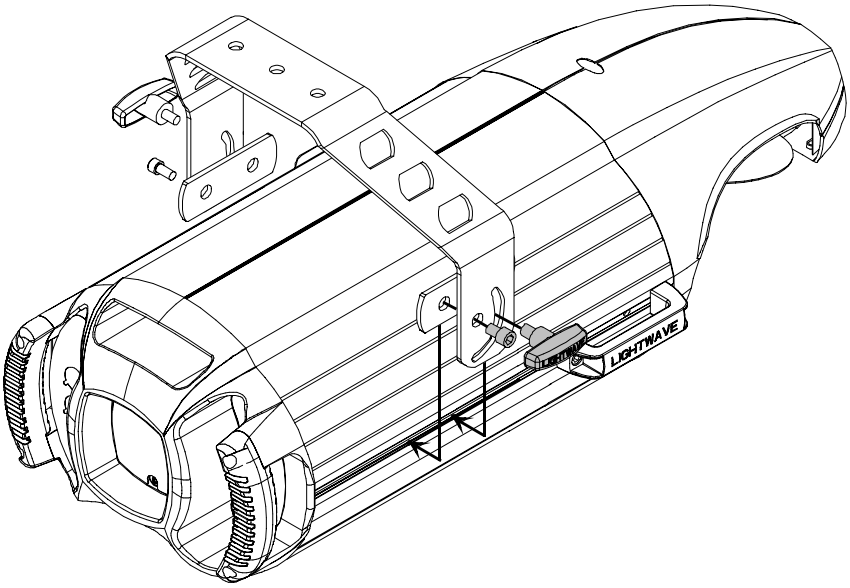


Figure 1-2. Installing the yoke on the fixture.

3. Manually screw one T-handle into each side of the fixture. Do not fully tighten the T-handles.
4. If you want to reposition the yoke, use a 1/4" allen wrench to loosen the allen screws on the side handles shown in Figure 1-1 on page 1-9.
5. After loosening the side handle allen screws, slide the yoke to the desired position. If you want to hang the fixture straight down, see the section titled "Hanging the Fixture Straight Down" on page 2-13 now.
6. Make sure the yoke is even (i.e., the same distance from the rear of the fixture on both sides).
7. Securely tighten the four side handle allen screws (two on each side).
8. Tilt the fixture to the desired angle, then securely tighten the other allen screws and T-handle. You are finished.

Setting the Fixture Voltage

Technobeam, Technopro and Technoray are shipped from the factory set for 230V, 50Hz and offer the following switch-selectable voltage/ frequency settings:

230 V, 50 Hz	208 V, 60 Hz
100 V, 50 Hz	100 V, 60 Hz
120 V, 50 Hz	120 V, 60 Hz

The recommended fuse F3 for all voltages and frequencies is:

F3 - **250V, 6.3A, Slow Blow Only.**

WARNINGS

(1) Check the voltage setting before proceeding with equipment setup!

(2) The information in this section is intended to assist qualified service personnel because this fixture is to be serviced by qualified service personnel *only***.**

(3) Disconnect power before re-lamping or servicing.

(4) Replace fuses with specified type and rating only.

1. Make sure the fixture is disconnected from the power outlet before proceeding.
2. Lay the fixture on its back and locate the door retaining screw, as shown in Figure 1-3. Loosen the screw and remove the door.

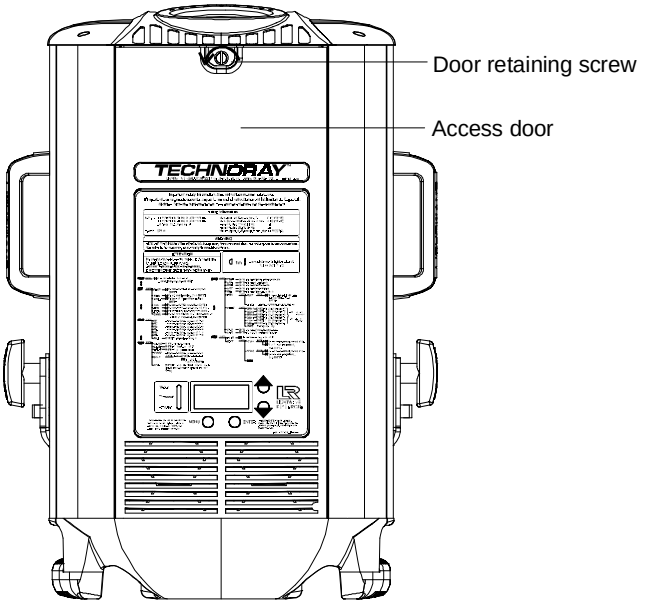


Figure 1-3. Removing the door allows you to access the fixture's voltage selection switches, as well as wheels and optics.

3. Locate the three switch blocks—labeled SW1, SW2 and SW3—by the LED display, as shown in Figure 1-4:

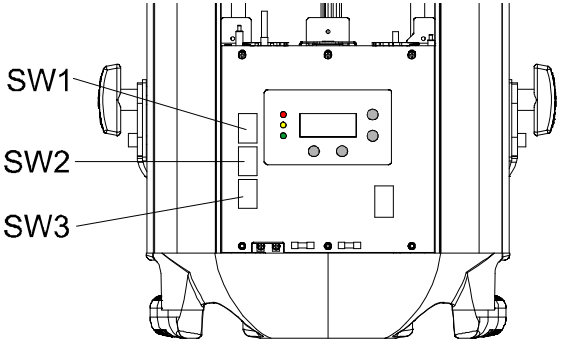


Figure 1-4. The three voltage selection switches are located next to the LED display.

4. Choose a voltage/frequency setting as shown in Figure 1-5:

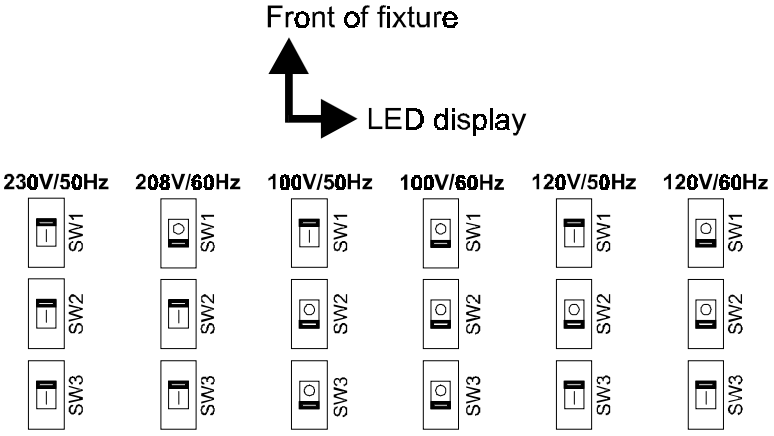


Figure 1-5. Setting the fixture's voltage and frequency.

5. Replace the access door, unless you want to install the optional narrow lens set or set the beam angle as shown in the next section.

Setting the Beam Angle

This section explains how to set the fixture's beam angle. (It also shows how to install the optional 8 to 12 degree narrow angle lens set.) You can change the beam angle, for example, if you are having trouble focusing precisely on a very detailed image.

Selecting a larger beam angle results in a larger-diameter image, but can also result in some loss of image resolution and light intensity.

Note All beam angles are accurate to ±1˚.

1. Unplug the fixture and remove the access door shown in Figure 1-3 on page 1-12 if you have not done so already.
2. Lay the fixture on its back and locate the lens tube as shown in Figure 1-6.

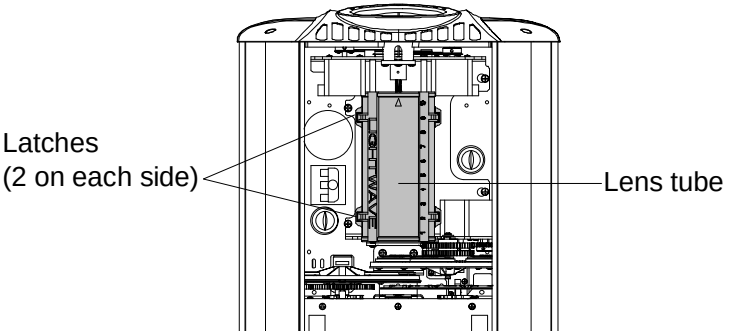


Figure 1-6. The lens tube contains the zoom lenses.

3. The lens tube cover has two latches on each side that secure it in place; see Figure 1-7. Squeeze the latches together to remove the lens tube cover.

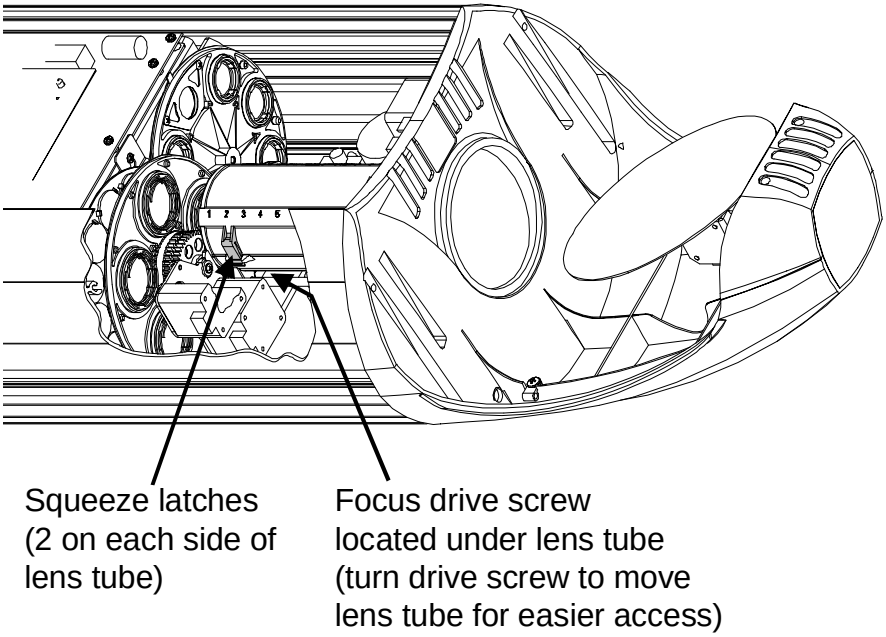


Figure 1-7. Squeeze the two latches on each side of the lens tube to open the cover.

Hint If the latches are difficult to access, reach under the lens tube and manually turn the focus drive screw to move the lens tube toward the rotating effects wheel.

4. The factory-installed 11 to 17 degree lens set is shown Figure 1-8:

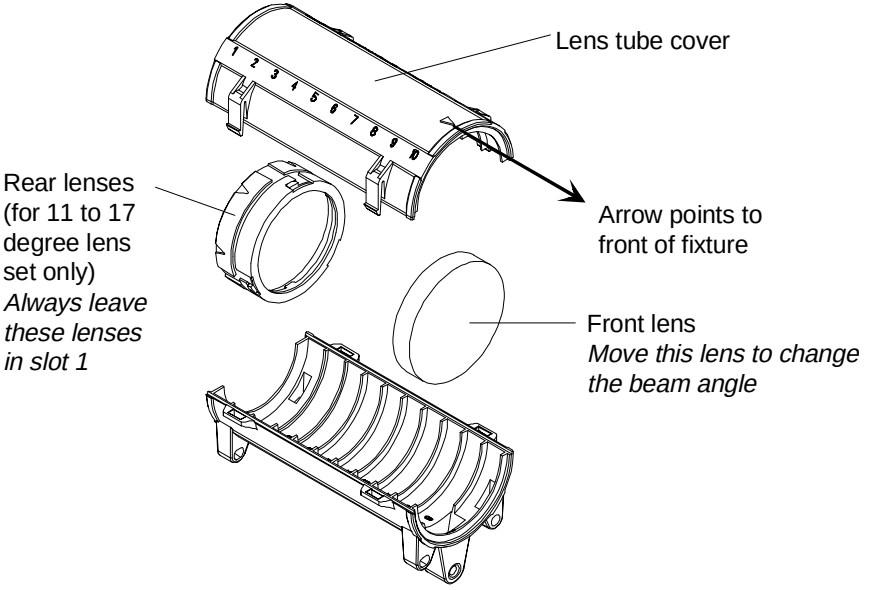

Lens tube cover
1 2 3 4 5 6 7 8 9 10
Rear lenses (for 11 to 17 degree lens set only) *Always leave these lenses in slot 1*
Arrow points to front of fixture
Front lens
Move this lens to change the beam angle

Figure 1-8. Components of the factory-installed 11 to 17 degree lens set.

5. *This step applies to the optional 8 to 12 degree narrow angle lens set only.*

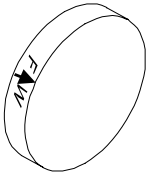
   a. Remove all lenses shown in Figure 1-8 and put them in a safe place where they will not get scratched.

   b. Use Table 1-3 on page 1-16 to install the two lenses in the 8 to 12 degree narrow angle lens set. The name and orientation of each lens is printed on the side of the lens. The arrow printed on each lens must point *toward the aperture* (i.e., away from the lamp).

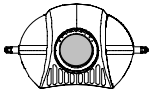
6. Lens positions in the lens tube are numbered from 1 to 10, both on the lens tube cover and on the bottom portion of the lens tube. Use those numbers and either Table 1-2 on page 1-16 or Table 1-3 on page 1-16 to move the lenses to correspond with the desired beam angle. The arrow printed on the lens must point toward the front of the fixture (i.e., away from the lamp).

Caution **Handle the lenses by the edge only. Fingerprints can result in lower image quality. Use only a soft, lint-free cotton cloth to clean lenses. Use a mild glass cleaning solution if necessary to clean built-up dust or dirt.**

Lamp (arrow points away from)



Aperture (arrow points toward)



One of the following will be printed on each lens:

F ↑ W Front lens, factory-installed lens set

R ↑ W Rear lens, factory-installed lens set

F ↑ N Front lens, optional narrow angle lens set

R ↑ N Rear lens, optional narrow angle lens set

Table 1-2. Beam Angles for Factory-Installed 11 to 17 Degree Lens Set

Beam Angle	Front Lens Position*
11.5°	10
13.5°	8
15°	6
16.5°	4
17.5°	3
* - For the 11 to 17 degree lens set, the rear lenses must always be placed in slot 1 (see Figure 1-8 on page 1-15).	

Table 1-3. Beam Angles for Optional 8 to 12 Degree Narrow Angle Lens Set

Beam Angle	Rear Lens Position	Front Lens Position
8°	1	10
8.6°	2	10
9.1°	2	9
9.7°	2	8
10.3°	3	8
10.8°	3	7
11.4°	3	6
12°	3	5

7. When you are finished, replace the lens tube cover, making sure to point the arrow on the cover toward the front of the fixture.

Chapter 2
Setting Up Your Fixture

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Homing the Fixture 2-2
LED Display 2-2
Status LEDs 2-3
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What Kind of Cabling Should You Use? 2-5
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Powering On the Fixture

Do all of the following before powering on the fixture:

1. Select the correct voltage and frequency settings for the power outlet you will be using. See the section titled “Setting the Fixture Voltage” on page 1-11.
2. Install the appropriate power cord cap as described in the section titled “Installing the Power Cord Cap” on page 1-8.
3. Replace the access door shown in Figure 2-2 on page 2-3.

Homing the Fixture

Connect the fixture to an appropriately-rated power outlet; there is no power switch. You will hear the sounds of the motors and gears as they home. *This is normal.*

LED Display

When the fixture has finished homing, the LED display should show the fixture’s firmware version, similar to Figure 2-1:

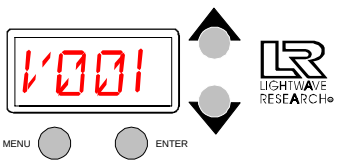


Figure 2-1. The initial LED menu display shows the fixture’s firmware version.

Note The LED display will alternate between the version number (shown above) and the fixture’s fixture number or DMX start channel unless an error occurs during start-up.

If the fixture fails to home, or if the menu displays an error message, see the section titled “Troubleshooting” on page 2-16 now.

Status LEDs

Technobeam, Technopro and Technoray fixtures have three status LEDs located on the access door, as shown in Figure 2-2:

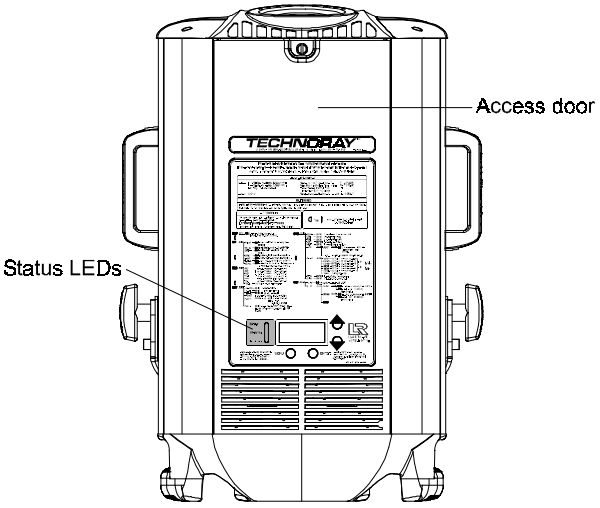


Figure 2-2. Location of the three status LEDs on the fixture's access door.

Table 2-1 describes the three status LEDs:

Table 2-1. Status LEDs

LED name	State	Problem Indication?	Description
Motor	solid red	No	The motors are receiving adequate voltage.
	OFF	Yes	Fuse or power failure. See below.
Transmit	OFF	Not necessarily*	No data is being transmitted.
	flickering yellow	No	A firmware crossload is taking place.
	solid yellow	Yes†	Software or hardware failure.

Table 2-1. Status LEDs

LED name	State	Problem Indication?	Description
Receive	OFF	Not necessarily*	No data is being received.
	flickering green	No	Fixture is receiving data.

If the LED states indicate a problem, see the section titled "Troubleshooting" on page 2-16.

* - The Receive LED will not be ON unless the fixture is connected to a DMX 512 link with a working controller. If you have already connected the fixture to a controller and are sending DMX 512 commands to the fixture, and the Receive LED is OFF, see the section titled "Troubleshooting" on page 2-16.

† - Unless this fixture is crossloading, the yellow Transmit LED should never be ON solid. (The Transmit LED will flicker yellow if you have enabled preset playback *and* the fixture is set for either fixture number 1 or DMX start channel 1. This is due to preset playback synchronization, as described in "Synchronizing Preset Playback" on page 4-10.) Try unplugging the fixture, waiting a few minutes, then plugging it back in. If the Transmit LED continues to be ON, contact High End Systems Customer Service in one of the ways shown in the section titled "Getting Help" on page Intro-4.

More information about crossloading firmware is shown in the section titled "Upgrading Firmware" on page 2-14.

Overview of Controller Operation

In order to coordinate the playback of multiple Technobeam, Technopro or Technoray fixtures from a central location, you need to connect the fixtures to a DMX 512-compatible controller using XLR data-grade cabling.

What is DMX 512 Protocol?

DMX 512 is an industry-standard protocol for controlling lighting fixtures and other devices (such as lasers and hazers). Developed by the United States Institute of Theatre Technology (USITT), DMX 512 is supported by leading entertainment industry equipment manufacturers.

DMX 512 (*D* for *digital*, *MX* for *multiplex* and *512* is the number of

channels per link) is a reliable, efficient and well-understood control protocol. Its strength lies in its ability to control virtually any mix of DMX-compatible devices on the same link using a DMX-compatible controller.

What Kind of Cabling Should You Use?

There are two main types of cabling you can use: microphone cable and data-grade cable. Although pin-compatible microphone cable is suitable for small-scale designs, data cable is recommended, especially for longer cable runs. Data cable is designed to carry a higher-quality signal with less susceptibility to electromagnetic interference.

The cable you use should have the characteristics listed below:

- 2-conductor twisted pair plus a shield
- maximum capacitance between conductors - 30 pF/ft.
- maximum capacitance between conductor and shield - 55 pF/ ft.
- maximum resistance of 20 Ω/1000 ft.
- nominal impedance 100–140 Ω
- 22–24 AWG with insulation having a dielectric rating of 300 volts or higher

For example, Belden® 9841 data-grade cabling meets specifications for EIA RS-485 applications and is highly recommended (or its equivalent) for use with Technobeam, Technopro or Technoray.

Constructing Cabling

If you need to construct cabling, you must use a shielded, two-conductor cable with a male 3-pin XLR connector on one end and a female 3-pin XLR connector on the other end. Pin 1 is the common (cable shield), pin 2 is the data complement (negative), and pin 3 is the data true (positive).

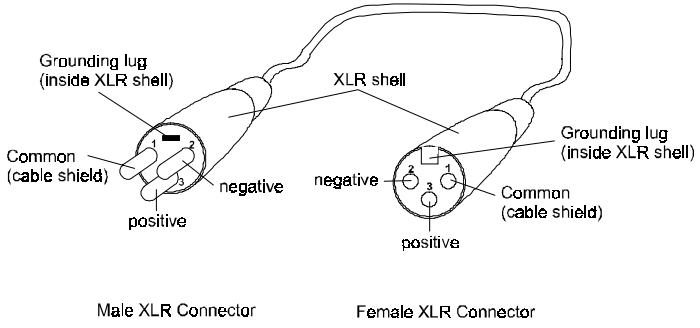


Figure 2-3. Properly-constructed data cabling.

You should test each cable with a voltage/ohm meter (VOM) to verify correct polarity and to make sure that the negative and positive pins are not grounded or shorted to the shield or to each other. Also, make sure that pin 1 is shielded.

Caution **Do not connect anything to the ground lug on the XLR connectors. Do not connect or allow contact between the common (cable shield) and the fixture's chassis ground. Grounding the common could cause a ground loop and/or erratic behavior.**

Terminators

The last device on each link must have a 120 ohm, 1/4 watt (minimum) terminator attached to its Data Out connector.

You can construct terminators by following the instructions below:

1. Obtain a male XLR connector.
2. Disassemble the connector.
3. Solder a 120 ohm resistor, minimum of 1/4 watt, between pins 2 and 3.
4. Reassemble the connector.
5. Install the terminator in the Data Out port of the last device in the link.

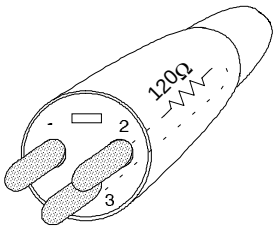


Figure 2-4. Constructing a data cable terminator.

Setting up the Link

You need to follow the guidelines below when setting up the DMX link:

1. Do not allow the DMX channel ranges (boundaries) used by two different devices on the link to overlap. Overlapping boundaries can disable one or both devices. More information about channel boundaries for Technobeam, Technopro and Technoray is found in Chapter 3. Consult the documentation provided with the other devices for their DMX channel ranges.
2. You can assign two fixtures of the same type (for example, two Technopro fixtures) the same DMX channel range if you want both fixtures to respond to control commands in exactly the same way.
3. *Firmware uploads (updates):* You must remove or bypass all controllers, non-High End Systems fixtures, optoisolators and serial

data distributors on the link if you want to perform firmware uploads or crossloads as described in the section titled "Upgrading Firmware" on page 2-14.

Dataflash® AF1000 xenon strobes, Intellabeam® automated luminaires, and Emulator® laser simulators will stop firmware uploads to Technobeam, Technopro or Technoray fixtures farther down the link. Make sure you put all of the Intellabeam fixtures, Emulator fixtures and AF1000 fixtures *after* all of the Technobeam, Technopro or Technoray fixtures.

4. As long as you observe all of the rules above, you can use whatever DMX channels and cabling scheme you want. You do not, for example, have to assign the lowest DMX start channel to the fixture directly connected to the controller. Use whatever channel and cabling scheme is simplest and results in the least amount of cabling.

Linking the Fixtures to the Controller

Starting with the controller, link fixtures using the procedure below. Refer also to Figure 2-5 on page 2-8 and Figure 2-6 on page 2-8.

1. Consult the documentation provided with the controller for the procedure to connect XLR cable to its Data Out connector.
2. Connect the female end of the XLR cable from the controller to the first fixture's male Data In connector.
3. Connect the male end of another XLR cable to the first fixture's female Data Out connector.
4. Continue connecting the Data Out connector from one fixture to the Data In connector to the next fixture until you have linked all of the Technobeam, Technopro or Technoray fixtures.
5. Connect other devices to the Technobeam, Technopro or Technoray fixtures as desired, using the instructions in the documentation provided with those devices.

   Place a male 120 ohm terminator on the female Data Out connector of the last device in the link. The procedure for making a terminator can be found in the section titled "Terminators" on page 2-6.

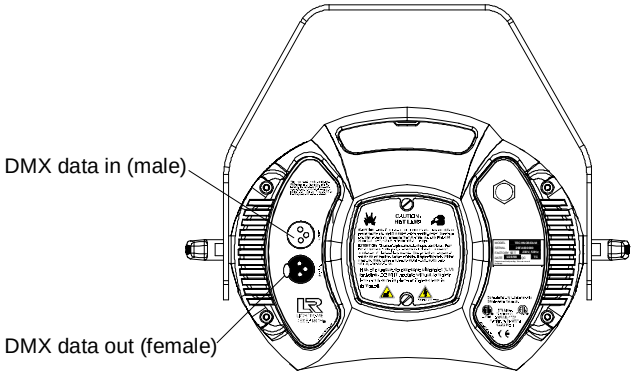


Figure 2-5. Location of the DMX data in (male) and DMX data Out (female) ports on the fixture's rear panel.

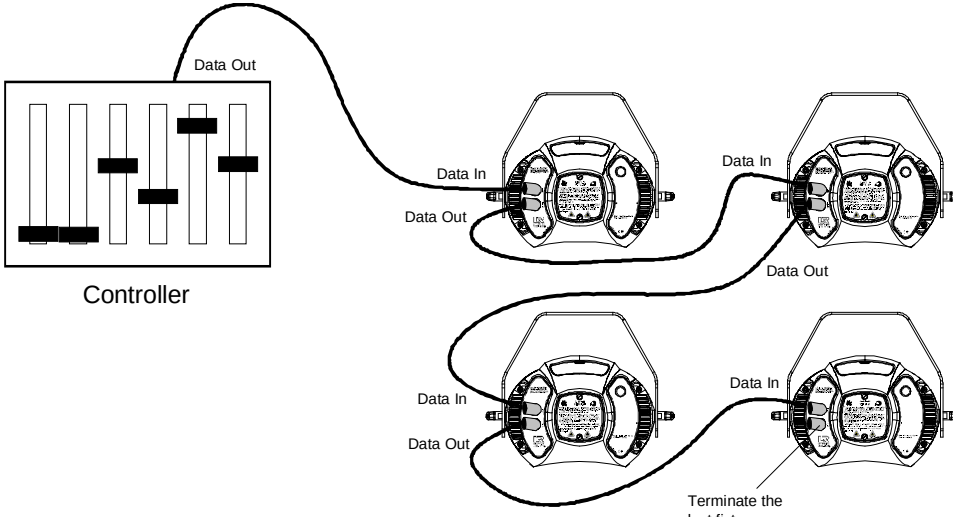


Figure 2-6. Connecting fixtures to a controller. Make sure you terminate the last fixture in the link.

Mounting the Fixture

You will need: ***- one 1/4" allen wrench***
- clamps and safety cable as described in this section

Your fixture is designed to be mounted in any orientation: you can even hang it with its aperture pointing straight down or stand it on its end handles. However you wish to mount the fixture, you must follow the precautions and suggestions below:

- Verify the input voltage you are using matches the fixture's voltage selection switches (see the section titled "Setting the Fixture Voltage" on page 1-11).
- Heed the warnings below to guard against personal injury and damage to the fixture.

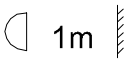
WARNINGS

(1) This equipment for connection to branch circuit having a maximum overload protection of 20 A.

(2) Class I Equipment - This fixture must be earthed.

(3) Mount the fixtures and controllers in a location that is away from direct heat and protected from moisture. Do not mount on a flammable surface.

(4) Maintain minimum distance of 1.0 meter (3.28 feet) from combustible materials.



(5) Observe minimum distance to lighted objects of 1.0 meter (3.28 feet). That means the fixture must be positioned at least 1 meter away from the object it is illuminating.

(6) Use secondary safety cable when mounting this fixture.

Standing the Fixture on its End Handles

The fixture's end handles are designed to support its weight; however, make sure you observe the following guidelines:

1. The fixture must be located away from moving objects that could strike it and cause it to become unbalanced.
2. The fixture must be mounted on a sturdy, stable surface.
3. If the surface is above floor height, make sure you use safety cables as described in the next section.

Mounting the Fixture on a Truss or Other Support System

If you are mounting the fixture on a truss or another type of support, do all of the following:

1. Verify the truss or support will handle the weight of all the devices you are mounting. Technobeam, Technopro or Technoray fixture weights are listed in the section titled "Weight (including yoke)" on page 1-2.
2. The use of user-supplied safety cable is strongly recommended. You must supply your own safety cable and you must verify the cable is capable of supporting the weight of the fixture as listed in the section titled "Weight (including yoke)" on page 1-2. You can order galvanized safety cables from your High End Systems dealer/distributor (part number 12040001). Also see the section titled "Optional Accessories" on page 1-6.
3. You must supply your own clamps to attach the fixture to the support. Verify that the clamp(s) you use are capable of supporting the weight of the fixture as listed in the section titled "Weight (including yoke)" on page 1-2. You can order deluxe C-clamps for a two-inch truss from your High End Systems dealer/distributor (part number 55000004). Also see the section titled "Optional Accessories" on page 1-6.
4. Make sure the fixture *cannot* be rotated all the way around (360°). Allowing the fixture to rotate 360° could loosen the clamp mounting bolts.

Note Because of the variety of conceivable lighting designs, you should consider the procedure below as a *suggested guideline* only. High End Systems, Inc. cannot make specific recommendations for your particular lighting design or venue.

Suggested mounting procedure:

1. Use two people to mount each fixture: one person to hold the fixture while it is being secured in place, and one person to secure the fixture to its support and to attach clamps and safety cables.
2. Always stand on a firm, stable surface. The fixture should be at a height where you can comfortably work on it, and should also be resting on a stable surface. *Do not try to hold up the fixture yourself while you are working on it.* The ideal method is to have two people install the fixture.
3. Attach a suitable clamp through one of the holes on top of the yoke. If you are attaching one clamp, use the middle hole on the yoke. *Use locking washers when attaching the clamp to the yoke.*

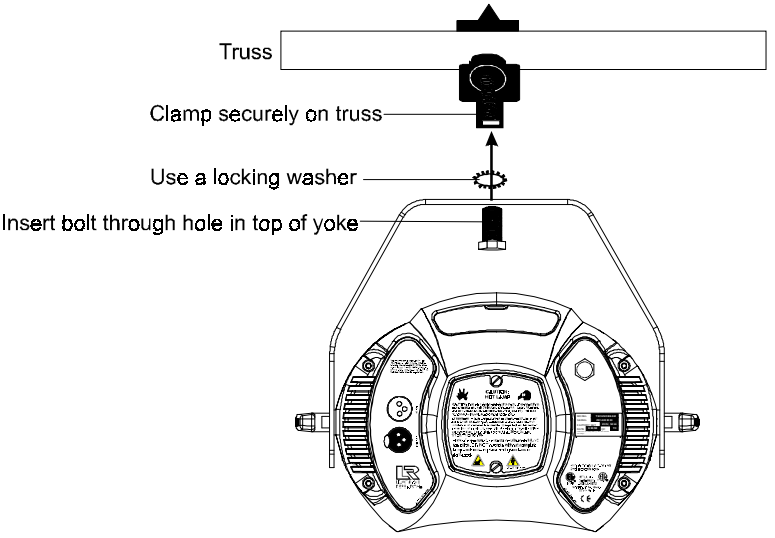


Figure 2-7. Use a locking washer when attaching a fixture to a truss.

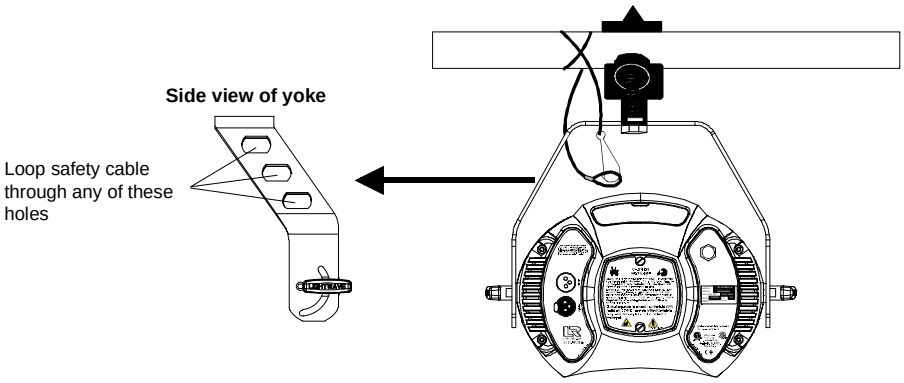


Figure 2-8. Always use a safety cable when mounting the fixture.

4. Loosen the T-handles on each side of the fixture (see Figure 2-9) and orient the fixture to the desired location.
5. Tighten the T-handles and adjust the position if you wish.
6. When you have the fixture in the position you want, firmly tighten the T-handles shown in Figure 2-9.

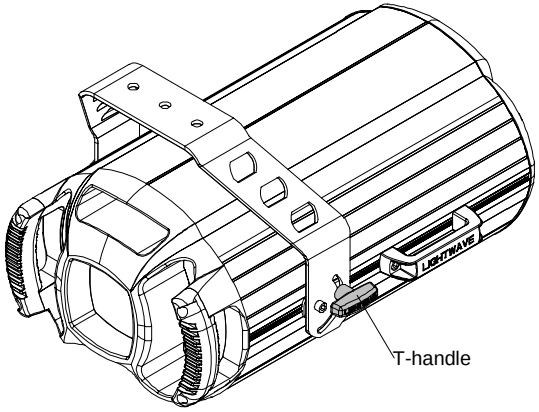


Figure 2-9. Location of the T-handle you use to adjust the yoke position.

Hanging the Fixture Straight Down

You can mount Technobeam with the mirror head perpendicular to the ground for projection onto a stage. This orientation also allows you to economize truss space by hanging fixtures side by side close to each other.

You must observe all of the precautions listed on the previous pages regarding clamps and safety cables.

Caution **You should adjust the yoke position with the fixture flat on the ground; otherwise, the fixture be damaged if it slides backward.**

1. Use a 1/4" allen wrench to loosen the yoke allen screws (see Figure 2-10).
2. Use a 1/4" allen wrench to loosen the four handle allen screws (two on each handle).
3. Slide the yoke to the rear of the fixture.
4. Loosen the T-handles on each side and rotate the yoke toward the rear of the fixture.

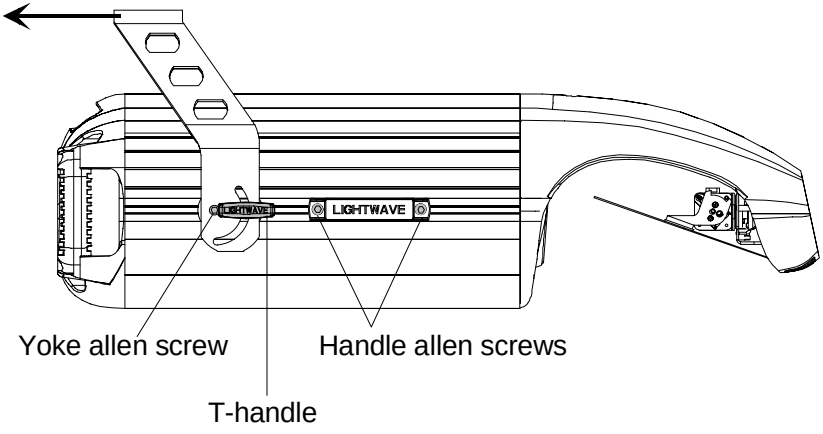


Figure 2-10. You can slide the yoke all the way back to allow the fixture to hang upside-down.

5. Tighten the allen screws and T-handles on both sides of the fixture, then secure the fixture to the truss using a C-clamp with a locking washer and safety cable as shown in Figure 2-11. When the fixture is

mounted like you want it, securely tighten the fixture's T-handles.

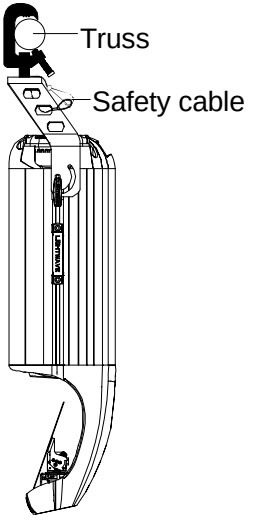


Figure 2-11. You can hang the fixture straight down as long as you follow all of the mounting precautions listed in this chapter.

Upgrading Firmware

There are two ways you can upgrade the *firmware* (fixture-specific operational code) to Technobeam, Technopro or Technoray fixtures attached to a DMX link:

- **Uploading firmware from Status Cue.** You will need to obtain updated firmware from High End Systems or a dealer/distributor. Consult the *Status Cue User Manual* for more information about uploading.
- **Crossloading firmware between fixtures.** You will need one Technobeam, Technopro or Technoray fixture with updated firmware and you can then load the firmware across the DMX link to all other Technobeam, Technopro and Technoray fixtures on the same link.

The procedure that follows assumes you already have some familiarity with the menu system; if not, see Chapter 3 and the menu map located inside the back cover of this manual.

1. Remove or bypass all controllers, non-High End Systems fixtures, optoisolators or serial data distributors on the link. These devices will prevent crossloading.

2. If there are any Dataflash AF1000 xenon strobe fixtures, Emulator laser simulators or Intellabeam automated luminaires on the same link, make sure they are all *after* all of the Technobeam, Technoray or Technopro fixtures. If not, you must bypass all AF1000s, Emulators or Intellabeams until the upload is complete.

3. Start with the Technobeam, Technopro or Technoray fixture that has the newest firmware. Skip to Step 4 if you already know the firmware version on all your fixtures.

   a. Navigate to the **INFO** menu.

   b. Press <Enter> then use the <Up> or <Down> arrow keys to navigate to the **VER** option.

   c. Press <Enter>; the fixture's firmware version will be displayed similar to Figure 2-12:

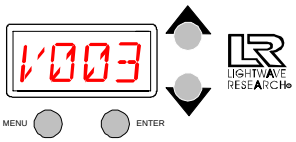


Figure 2-12. This fixture has firmware version 3.

4. Once you are sure which fixture has the newest firmware (the *crossloading* fixture), keep pressing the <Menu> key on that fixture until the **ADDR** option is displayed.

5. Use the <Up> or <Down> arrow keys to navigate to the **MODE** menu.

6. Press <Enter> and use the <Up> or <Down> arrow keys to navigate to the **XLD** option.

7. Press <Enter> to start the crossload. The Transmit LED on the crossloading fixture will remain ON (or flicker) during the crossload. The Transmit and Receive LEDs on other Technobeam, Technopro and Technoray fixtures on the link will flicker while the crossload is in progress.

8. When the crossload has finished successfully, the following will happen:

   - **DONE** will appear briefly in the LED display of the crossloading fixture, followed by MENU which will alternate with the fixture's fixture number or DMX start channel.
   - All of the other Technobeam, Technopro and Technoray fixtures will home themselves.

9. Otherwise, if an error message is displayed, see the section titled "Menu Error Messages" on page 2-24.

Troubleshooting

This section lists typical symptoms and solutions for problems you might encounter when using your fixture. If you need additional help, contact your dealer/distributor or High End Systems Customer Service in one of the ways shown in the section titled "Getting Help" on page Intro-4.

WARNING **This information is intended to assist qualified service personnel because this fixture is to be serviced by qualified service personnel *only*.**

Fixture does not work: no LEDs, fan, lamp, or other functionality 2-17

Lamp does not strike 2-17

Lamp shuts off 2-18

Fixture is not responding to control commands—"Receive" LED does not blink 2-18

Dim flags close, fixture does not respond to control commands, lamp shuts off, fan turns off 2-19

Color wheel or litho wheel is not centered in the beam or is in the wrong position 2-19

Lithos or dichroic filters are cracking 2-20

Other components cracked or heat damaged 2-20

Fixture will not accept firmware upload or crossload 2-21

Low light output, fuzzy images 2-21

Fixture does not work: no LEDs, fan, lamp, or other functionality

Possible causes and solutions:

1. *Cause*: No input power.

   Solutions: Do all of the following:

   a. Verify that the fixture is plugged into a working power supply.

   b. Verify the integrity of the power cord and the wiring of the power cord cap as shown in the section titled "Installing the Power Cord Cap" on page 1-8.

2. *Cause*: One or more fuses have failed.

   Solution: Follow the directions in the section titled "Replacing Fuses" on page 6-3 to inspect the fuses and replace them if necessary.

Lamp does not strike

Possible causes and solutions:

1. *Cause*: Improper voltage setting or power cord cap wiring.

   *Solution*s: Do both of the following:

   a. Make sure the fixture is set for the same voltage as the power supply. See "Setting the Fixture Voltage" on page 1-11.

   b. Make sure the power cord cap is wired correctly. See "Installing the Power Cord Cap" on page 1-8.

2. *Cause*: One or more fuses have failed.

   Solution: Follow the instructions in the section titled "Replacing Fuses" on page 6-3 to inspect the fuses and replace them if necessary.

3. *Cause*: Bad lamp.

   Solution: Replace with a new or known good lamp.

Lamp shuts off

Possible causes and solutions:

1. *Cause*: Over-temperature. An over-temperature condition can be confirmed by the message **OVER TEMP** on the fixture's LED display.

   Solution: See the section titled "Menu Error Messages" on page 2-24.

2. *Cause:* Fan has failed.

   Solution: Cause the fixture to home, either by unplugging the fixture and plugging it back in, or by selecting **HOME** from the Test menu. Put your hand over the exhaust vent shown in Figure 2-13. You should feel a slight breeze from the fan. If not, the fan has failed. Contact High End Systems Customer Service as shown in "Getting Help" on page Intro-4.

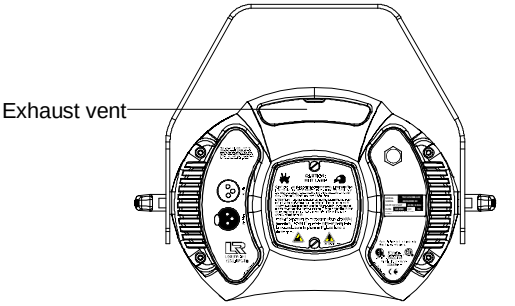


Figure 2-13. Location of the fixture's exhaust vent.

3. *Cause*: Lamp socket is loose, causing arcing.

   Solution: Replace the lamp socket assembly. Call your High End Systems dealer/distributor for more information.

4. *Cause*: Aging lamp.

   Solution: Replace with a new or known good lamp.

Fixture is not responding to control commands—"Receive" LED does not blink

Possible causes and solutions:

1. *Cause*: Faulty XLR cable.

   Solutions: Do one or both of the following:

   a. Replace XLR cables going to the fixture's Data In and Data Out connectors with known good cables.

   b. Verify cable integrity using cable test equipment.

2. *Cause*: There is no controller attached to the link, or the controller

is not generating any output.

Solution: Verify that a controller is attached to the link. Verify that the controller is generating output by sending commands to a known working device.

Also see the section titled "Troubleshooting DMX Data" on page 2-22.

3. *Cause*: One or more fuses have failed.

   Solution: Follow the instructions in the section titled "Replacing Fuses" on page 6-3 to inspect the fuses and replace them if necessary.

Dim flags close, fixture does not respond to control commands, lamp shuts off, fan turns off

Possible causes and solutions:

1. *Cause*: Faulty XLR cable.

   Solutions: Do one or both of the following:

   a. Replace XLR cables going to the fixture's Data In and Data Out connectors with known good cables.

   b. Verify cable integrity using cable test equipment.

   c. See the section titled "Troubleshooting DMX Data" on page 2-22.

2. *Cause*: One or more fuses have failed.

   Solution: Follow the instructions in the section titled "Replacing Fuses" on page 6-3 to inspect the fuses and replace them if necessary

Color wheel or litho wheel is not centered in the beam or is in the wrong position

Cause: Non-High End Systems dichroic or litho does not meet specifications. A litho that is slightly under the recommended thickness, for example, can turn in the wheel as the wheel rotates, causing the litho to become uncentered.

Solution: Make sure all dichroics and lithos meet the specifications listed in the section titled "Specifications" on page 6-5.

Lithos or dichroic filters are cracking

Possible causes and solutions:

1. *Cause*: Improper installation.

   Solution:

   a. **General:** Make sure you are using dichroics and lithos that meet the specifications shown in the section titled "Specifications" on page 6-5.

   b. **Lithos:** Lithos must be oriented with the coated side facing *away from* the lamp and the glass (uncoated) side facing *toward* the lamp. In the case of textured lithos, face the textured side away from the lamp and the flat side toward the lamp.

   c. **Color wheel dichroic filters:** Dichroic filters should be oriented with the coated side facing *toward* the lamp and the glass (uncoated) side facing *away from* the lamp. Figure 6-6 on page 6-8 shows how to tell which side is which.

2. *Cause*: Faulty hot mirror allowing overheating inside the fixture.

   Solution: Visually inspect the hot mirror for cracks or deep scratches as shown in the section titled "Cleaning the Lenses and Mirrors" on page 6-17.

3. *Cause:* Fan has failed.

   Solution: Cause the fixture to home, either by unplugging the fixture and plugging it back in, or by selecting **HOME** from the Test menu. Put your hands over the air exhaust shown in Figure 2-13 on page 2-18. You should feel air movement. If not, the fan has failed. Contact High End Systems Customer Service as shown in "Getting Help" on page Intro-4.

Other components cracked or heat damaged

Possible causes and solutions:

1. *Cause*: Faulty hot mirror allowing overheating inside the fixture.

   Solution: Visually inspect the hot mirror for cracks or deep scratches as shown in the section titled "Cleaning the Lenses and Mirrors" on page 6-17.

2. *Cause:* Fan has failed.

   Solution: Cause the fixture to home, either by unplugging the fixture and plugging it back in, or by selecting **HOME** from the Test menu. Put your hands over the air exhaust shown in Figure 2-13 on page 2-18. You should feel a slight breeze from the fan. If not, the fan has failed. Contact High End Systems Customer Service as shown in "Getting Help" on page Intro-4.

Fixture will not accept firmware upload or crossload

Possible causes and solutions:

1. *Cause*: Incorrect Status Cue configuration.

   Solution: Consult the *Status Cue User Manual* to make sure you are selecting the correct fixtures to upload, that you have the correct firmware file, and are using the correct DMX channels for the fixtures.

2. *Cause*: No return communication (indicated by Transmit LEDs OFF for all fixtures on the link when you are trying to perform the crossload or upload).

   Solution: Make sure you bypass any non-High End Systems fixtures, optoisolators or serial data distributors. These devices stop the communication required for firmware crossloads or uploads. AF1000 fixtures, Intellabeam fixtures or Emulator fixtures on the same link as Technobeam, Technopro or Technoray can also prevent communication from Technobeam, Technopro or Technoray. See the section titled “Setting up the Link” on page 2-6 for more information.

Low light output, fuzzy images

Possible causes and solutions:

1. *Cause:* Incorrect lens installation.

   Solution: Make sure you have installed the lenses in the correct orientation, as shown in the section titled “Setting the Beam Angle” on page 1-13.

2. *Cause*: Aging lamp.

   Solution: Replace the lamp with a new or known good lamp.

3. *Cause*: Dirty optical path.

   Solution: Clean all lenses, filters, lithos and the anti-reflective glass as shown in the section titled “Cleaning the Internal Components” on page 6-16.

Troubleshooting DMX Data

This section explains how to use the DMX diagnostics built into Technobeam, Technopro and Technoray to isolate data problems either to the fixture or to the DMX 512 link. The instructions in this section should be followed *only* by people with a good understanding of the DMX 512 protocol and the fixture's menu system.

If you are having trouble with a fixture(s) on your DMX 512 link, you should first review the following:

1. Are DMX 512 control commands being "misinterpreted" by the fixture? If so, make sure the controller is configured for the correct fixture type. For example, if you have a Technobeam set for full, 18-channel protocol, but the controller is sending Technoray channel values, none of the values you send from the controller will have the expected effect. Continuing the same example, sending a value on channel 8 (which is effect wheel spin speed for Technoray) will result in selecting a rotating litho wheel position on Technobeam.
2. Is more than one device affected? If so, and the devices are addressed sequentially on the link, check to make sure addressing was done properly on all affected devices. In particular, if you are using fixture numbering, review the DMX channel boundaries for all affected fixtures. Table A-6 on page A-23 shows fixture number to DMX channel boundaries for Technobeam, Technoray and Technopro.
3. Make sure the last device on the link is terminated.
4. Are the gears and motors moving at all? If not, check for a loose cable connection or a cable break somewhere on the link. If possible, verify cable integrity or replace questionable cable with known good cable.
5. Make sure the controller is generating output. Consult the documentation provided with the controller for more information.

   If after doing those things you are still having problems, see one of the following sections.

View DMX Data for a Fixture

This procedure allows you to view DMX data for a Technobeam, Technopro or Technoray fixture. You should follow this procedure if you are having a particular problem with a fixture; for example, a color wheel that does not respond to commands from the controller.

1. Navigate to the **INFO** menu.

2. Press <Enter>, then use the <Up> and <Down> arrow keys to navigate to the **DMX** option.

3. Press <Enter>, then use the <Up> and <Down> arrow keys to navigate to the **FIXT** option.

4. Press <Enter>. You can then use the <Up> and <Down> arrow keys to select a construct to test; for example, **COL** chooses the color selection channel. The card inside the back cover of this manual has a list of all the constructs you can choose from.
5. After selecting a construct, press <Enter>.
6. Vary the value for that construct on your controller. One of the following things will happen:
   a. **Value varies on the fixture's LED display, but the fixture does not respond.** The most likely reason is a faulty fixture. Remove the fixture from the link and try changing the same construct using preset programming as explained on the *Technobeam Quick Reference Card*. If you notice the same problem, contact High End Systems Customer Service.
   b. **Value on the fixture's LED display remains constant.** Remove the fixture from the link and try manipulating the constructs using preset programming as explained on the *Technobeam Quick Reference Card*. If the fixture still does not respond, there is a problem with the fixture. Contact High End Systems Customer Service. If, however, the fixture functions normally, the problem was likely with the DMX 512 link.

View DMX Data for Another Device

This procedure allows you to use a Technobeam, Technoray or Technopro fixture to view DMX 512 channel values for any device on the link, up to the DMX end channel of the Technobeam, Technoray or Technopro. You should use this procedure either for testing fixtures that do not have built-in DMX diagnostics, or if the fixture you are experiencing problems with is inconvenient to monitor directly.

1. Navigate to the **INFO** menu.

2. Press <Enter>, then use the <Up> and <Down> arrow keys to navigate to the **DMX** option.

3. Press <Enter>, then use the <Up> and <Down> arrow keys to navigate to the **DATA** option.
4. Press <Enter>. Use the <Up> and <Down> arrow keys to select a channel you wish to view.

   Note You can view any channel from 1 to the DMX end channel for this fixture. For example, if you perform this procedure on a Technobeam set for full, 18-channel protocol and addressed at DMX start channel 271, you will be able to view DMX channels 1—288.

5. Vary values on the controller. If the fixture does not respond, the fixture is faulty. Consult the documentation provided with that fixture for more information.

Menu Error Messages

This section lists the possible error messages that can appear on the fixture's LED display, as well as suggested actions. If the suggested action does not solve the problem or if you have additional questions, contact High End Systems Customer Service in one of the ways shown in the section titled "Getting Help" on page Intro-4.

Addr Lost

The fixture's firmware was unable to retrieve the fixture number or DMX start channel from non-volatile storage. Try unplugging the fixture, waiting a short time, then plugging it back in. If this error message reoccurs, contact High End Systems Customer Service in one of the ways shown in the section titled "Getting Help" on page Intro-4.

Boot Diff

(Boot difference error.) This message may occur after a firmware upload or crossload if new boot firmware has been included in the upload. Selecting **BOOT** from the Test menu will copy the new boot to the boot firmware storage area, and correct the cause of this error message.

EMEM Ack

This error may occur during data storage when an attempted write has taken too long. Attempt the operation again. If this message reoccurs, contact High End Systems Customer Service in one of the ways shown in the section titled "Getting Help" on page Intro-4.

EMEM [message]

(Memory error.) This error indicates the fixture was unable to retrieve one of the following from non-volatile storage:

- **CHNL**—the fixture's DMX start channel.
- **DPLY**—LED display status (on, off, dim).
- **FHRS**—number of fixture operating hours.
- **LENS**—lens set selection (NORM for factory-installed or optional narrow angle set, WIDE for optional wide angle lens set).
- **LHRS**—number of lamp operating hours.
- **L/ST**—lamp strikes.
- **MODE**—preset playback status (ON/OFF/SCN).
- **PERS**—the fixture's protocol (e.g., Technobeam full protocol).
- **PINV**—pan invert status.
- **TINV**—tilt invert status.
- **S/DN**—shutdown time.
- **SWAP**—pan/tilt swap status.
- **TIMB**—time base (seconds, minutes, hours) for preset playback.

The most likely cause is that an electrical event occurred and either interrupted data storage or caused the non-volatile memory to be corrupted. Try restoring the lost items manually. If the problem persists, contact High End Systems Customer Service in one of the ways shown in the section titled "Getting Help" on page Intro-4.

Erse Flsh

Occurs during a crossload when the time required to erase a fixture's memory is excessive. Remove the fixture from the link and contact High End Systems Customer Service. You might need to restart the crossload as well.

ID Lost

The system firmware was unable to read the fixture's ID number (fixture number or DMX start channel) from its non-volatile storage area. Try unplugging the fixture, waiting a short time, then plugging it back in. If this error message reoccurs, contact High End Systems Customer Service in one of the ways shown in the section titled "Getting Help" on page Intro-4.

Lamp

The word LAMP can appear on the display in two situations: one is an error; the other is normal.

- **Normal:** LAMP will be displayed when the fixture attempts to strike the lamp during fixture reset and homing. This is normal.
- **Not normal:** If the lamp is running, and for some reason—probably an electrical event—the fixture's operating code loses track of the lamp status, the lamp will turn off and the word "LAMP" will appear in the LED display. Allow the fixture 5 to 10 minutes to cool before trying to turn the lamp on again.

Link Busy

Occurs when the crossloading fixture detects that some other source is driving data on the link. For crossloads to work properly, you must remove or bypass all of the following if they are on the same link:

- Serial data distributors
- Optoisolators
- Non-High End Systems fixtures
- Controllers
- AF1000, Emulator or Intellabeam fixtures: Placing all AF1000, Emulator or Intellabeam fixtures *after* all Technopro or Technoray fixtures is a good way to do this.

After removing the offending device(s) from the data link, attempt the crossload again.

Link Empty

Occurs when the crossloading fixture fails to find any other Technobeam, Technopro or Technoray fixtures. If there are indeed other fixtures on the link, a communication failure has occurred.

Possible causes include:

1. A bad data cable between the crossloading fixture and the first fixture on the data link. Verify cable integrity with cable test equipment or replace with known good cabling.
2. See “Link Busy”, above.
3. One or more fixtures are powered off. Connect all fixtures on the link to appropriately-rated power outlets and try again.
4. If neither of the above solve the problem, the most likely cause is an electronics failure has occurred in the data section of one of the fixtures on the data link. Try powering off one fixture at a time and attempting the crossload. If you can isolate the crossload problem to one fixture in particular, remove that fixture from the link and contact High End Systems Customer Service in one of the ways shown in the section titled “Getting Help” on page Intro-4.

Over Temp

The internal fixture temperature has exceeded the maximum allowable temperature. The lamp and the motors will shut down.

1. The primary external cause is high ambient air temperature. The fixture’s maximum ambient temperature rating is shown in the section titled “Environmental Specifications” on page 1-5. Unplug the fixture and wait 5 to 10 minutes for it to cool before plugging it back in.
2. If allowing the fixture to cool does not solve the problem, check to make sure the fan is working. Cause the fixture to home, either by selecting **HOME** from the Test menu, or by unplugging the fixture and plugging it back in. Place your hand over the air exhaust shown in Figure 2-13 on page 2-18. You should feel air movement. If not, the fan has failed. Contact High End Systems Customer Service in one of the ways shown in the section titled “Getting Help” on page Intro-4.
3. If the fan is working, unplug the fixture and verify the voltage setting matches the power supply as shown in the section titled “Setting the Fixture Voltage” on page 1-11. If the voltage setting is correct, contact High End Systems Customer Service in one of the ways shown in the section titled “Getting Help” on page Intro-4.

PRST Lost

(Preset Lost.) Scenes (presets) stored in the fixture's onboard eight-scene memory were lost.

The causes and solution for this error are the same as for "EMEM [message]".

PGRM Time

Occurs during a crossload when a receiving fixture has exceeded the maximum allowable programming time. The crossloading fixture will make a number of attempts to send new program data to each of the receiving fixtures. If the receiving fixtures fails to respond properly after a number of programming attempts have been made, the crossloading fixture will drop the offending fixture from the upload list, and display this error message.

Try removing one fixture at a time from the link and attempting the crossload again. If you can isolate the crossload problem to one fixture in particular, contact High End Systems Customer Service in one of the ways shown in the section titled "Getting Help" on page Intro-4.

Shut Down

The fixture has received a Shutdown command from the controller and has shut down; i.e., the lamp and motors have been turned off. Homing the fixture will bring it out of shutdown.

Chapter 3
Using the Menus

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Menu Map

A complete map of the menu system for Technobeam, Technoray and Technopro can be found in the inside back cover of this manual. This menu system is current as of the time this manual went to print (February, 1998).

Once you follow the step-by-step example in the section titled "Step-By-Step Example" on page 3-4, you should be able to use the menu map to do anything you like.

Certain other menu functions are documented in the *Technobeam Quick Reference Card* (p/n 60600109, v1.0 or later).

Chapter 4 has more information about using the menus to program the fixture's eight onboard scenes (presets).

Menu System Overview

This section provides an overview of the intuitive menu system for Technobeam, Technopro and Technoray and gives an example of how to use it.

Among the things the menu system allows you to do:

- Store and play back a program of up to 8 scenes (see Chapter 4).
- Set the fixture number or DMX start channel for DMX 512 control.
- Crossload firmware to other fixtures on the same DMX 512 link.
- Home the fixture.
- Turn the lamp on or off.
- View status (fixture temperature, number of lamp hours, number of lamp strikes, firmware version).

Navigational Keys

Figure 3-1 shows the keys you use to navigate the menu system:

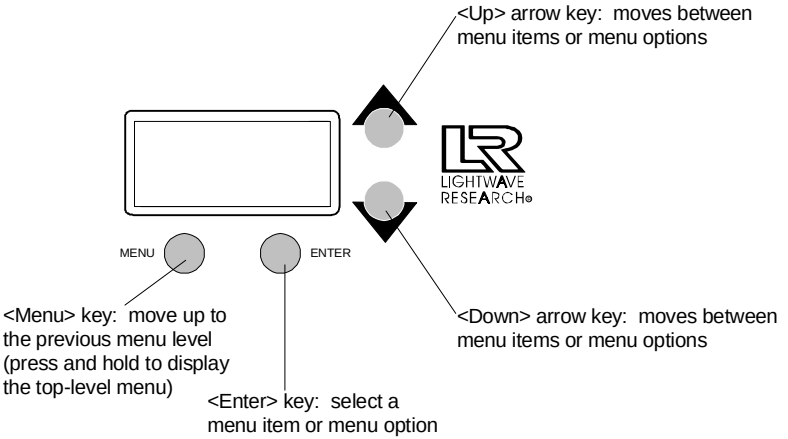
<Up> arrow key: moves between menu items or menu options
LIGHTWAVE RESEARCH
MENU
ENTER
<Menu> key: move up to the previous menu level (press and hold to display the top-level menu)
<Enter> key: select a menu item or menu option
<Down> arrow key: moves between menu items or menu options

Figure 3-1. You use the <Menu>, <Enter>, <Up> and <Down> keys to navigate the menu system.

There are two ways to get to the top-level ADDR menu:

1. If you have just powered up the fixture, press and hold the <Menu> key until **ADDR** appears in the LED display.
2. If you are currently in the menu system, keep pressing the <Menu> key until **ADDR** appears in the LED display.

Note If **MENU** is showing in the LED display, press the <Enter> key to display the ADDR option.

Flashing Options

A flashing option on the LED display means that option is *not* currently selected. When you press <Enter> to select a flashing option, that option stops flashing.

Step-By-Step Example

This step-by-step example shows how to set a DMX start channel or a fixture number for the fixture. Either a DMX start channel or a fixture number is required if you want to control the fixture with a DMX 512-compatible controller. However, you can skip this example if you are going to always use this fixture as a stand-alone and program it using the onboard eight-scene memory, as shown in Chapter 4.

Overview

Selecting a DMX start channel or fixture number involves the following 3 basic steps:

1. Selecting a protocol: The protocol is specific to the fixture and determines the number of DMX channels the fixture uses.
   - Technobeam (default) full protocol uses 18 channels, Technobeam reduced protocol uses 14 channels. The full protocol gives you more control over pan and tilt position, the rotating litho wheel position and litho spin speed. *You must select the full protocol if you want to use the Laser Aiming Device (LAD) or macros.*
   - Technoray (default) full protocol uses 14 channels, Technoray reduced protocol uses 12 channels. The full protocol gives you more control over the rotating litho wheel position and spin speed. *You must select the full protocol if you want to use macros.*
   - Technopro uses 12 DMX channels.
2. Selecting the control method: either fixture number or DMX start channel. (DMX start channel is recommended.) You must control the fixture using one method or the other. Appendix A shows the conversions between fixture numbering and DMX start channel, which you must understand if you want to use fixture numbering.
3. Selecting the fixture number or DMX start channel. The protocol together with the fixture number or DMX start channel determine the *channel boundary* the fixture uses. You must reserve the entire boundary for each fixture; overlapping boundaries will prevent all affected devices from operating normally.

Controlling via DMX Start Channel

For example, if you assign a Technopro fixture (which uses 12 DMX channels) to DMX start channel 1, you must reserve DMX channels 1—11 for that fixture alone. Allowing any other device (whether the device is a High End Systems luminaire or a different type of device) to use any of the channels from 1—11 will prevent one or both of those devices from operating normally.

Controlling via Fixture Number

Translate the fixture number to a channel boundary. For example, if you have a Technobeam using full protocol (18 channels) set to fixture number 3, that fixture uses channels 37—54. If you have a Technoray using full protocol (14 channels) on the same link, you *cannot* assign fixture number 4 (DMX channels 43—56) to the Technoray; you must assign fixture number 5 or higher. If you have a Technopro (or a Technoray using reduced protocol), you must assign it fixture number 6 or higher.

When Channel Overlap is Allowed

The *only* time you can allow more than one device to share DMX boundaries is when you want those same-type devices (for example, two Technopros) to respond to control commands in exactly the same way. In that case, make sure you assign the two devices the exact same DMX start channel or fixture number.

Procedure

1. Connect the fixture to an appropriately-rated power outlet, if you have not already done so. (There is no power switch.) Wait for the fixture to finish homing (the gears and motors stop moving).

2. Press and hold the <Menu> key until **ADDR** appears in the LED display.

   Note If you are already in the menu system, keep pressing (but do not hold down) the <Menu> key until **ADDR** is displayed.

   If **MENU** is displayed, press the <Enter> key to view the ADDR option.

3. Use the <Up> or <Down> arrow keys to navigate to the **MODE** menu.

4. Press <Enter> and use the <Up> and <Down> arrow keys to select one of the following, depending on which fixture and what level of protocol support you want. For details of DMX 512 control, see Appendix A.

    a. **TB F**—Technobeam full protocol. (Recommended, unless you need to conserve the extra four DMX channels for other devices on the link.) Select this option *only* if you have the Technobeam fixture and you want to use the full 18-channel support. *You must select full protocol if you want to use the Laser Aiming Device or macros under DMX 512 control.*

    b. **TB R**—Technobeam reduced protocol. Select this option *only* if you have the Technobeam fixture and you want reduced, 14-channel support.

    c. **TR F**—Technoray full protocol. (Recommended, unless you need to conserve the extra two DMX channels for other devices on the link.) Select this option *only* if you have the Technoray fixture and you want to use the full 14-channel support. *You must select full protocol if you want to use macros under DMX 512 control.*

    d. **TR R**—Technoray reduced protocol. Select this option *only* if you have the Technoray fixture and you want reduced, 12-channel support.

    e. **TPRO**—Technopro protocol. Select this option *only* if you have the Technopro fixture.

5. Press <Enter> to accept your selection. Wait for the fixture to finish homing.

6. Press and hold the <Menu> key until **ADDR** appears in the LED display.

7. Press the <Up> or <Down> arrow keys until **SET** appears in the LED display.

8. Press <Enter>, then use the <Up> or <Down> arrow keys to navigate to the **CHNL** option.

9. Press <Enter> and use the <Up> and <Down> arrow keys to select one of the following:

    - **ADDR**: You will select a fixture number to control the fixture using a DMX 512-compatible controller. You should choose this option *only* if you are very familiar with the DMX 512 protocol.

      You must convert the fixture number to a DMX start channel using the formula below:

      {(Fixture number - 1) * [number of channels]} + 1 = DMX start channel

      For example, if you set a Technopro (which uses 12 channels) to fixture number 3, the DMX start channel would be:

      {(3 - 1) * 12 } + 1 = 25

      Appendix A has a conversion table between fixture number and

DMX channel boundary. Remember to reserve *the entire boundary,* not just the starting channel, for each fixture on the link.

- **DMX:** You will select a DMX start channel to control the fixture using a DMX 512-compatible controller. This option is recommended because it will work with any DMX 512-compatible controller and with any mix of DMX 512-compatible devices on the link. Remember to reserve *the entire boundary,* not just the starting channel, for each fixture on the link.

10. Press <Enter> to accept your selection. If the option was flashing before you selected it, pressing <Enter> causes it to stop flashing. A flashing option means that it is *not* currently selected.

11. Keep pressing the <Menu> key until **ADDR** is displayed.
12. Press <Enter>. The LED display appears in one of the ways shown in Figure 3-2:

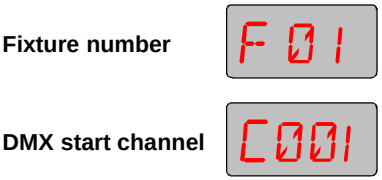

Figure 3-2. The LED display shows "F xx" if you selected fixture numbering for the control method, or "Cxxx" if you selected a DMX channel.

13. Use the <Up> and <Down> arrow keys to select either a fixture number or a DMX start channel. Be sure to keep the following in mind:
    - **In general:** Select a unique fixture number or DMX channel boundary for each fixture you wish to respond independently to your controller.
    - **If you are using fixture numbering:** Use the formula in Step 9 or consult Appendix A to make sure the DMX channel range (boundary) for this fixture does not overlap the channels used by any other device on the same link.
    - **If you are using a DMX start channel:** You can select any channel you wish; however, make sure the DMX channel range for this fixture does not overlap the channels used by any other device on the same link.
14. Press the <Enter> key to save your selection, then keep pressing the <Menu> key until **ADDR** appears in the LED display. You are finished.

Chapter 4
Preset Programming

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Programming Overview

This chapter explains how to create and play back scenes in the fixture's onboard 8-scene memory, and has a step-by-step example. More information about preset programming can be found on the *Technobeam Quick Reference Card* (p/n 60600109, v1.0 or later).

What is a "Scene"?

A *scene* (which can also be called a *page* or *look*) is a combination of the constructs you configure. A *construct* is a unique fixture feature—for example, focus, color or rotating effects. Each scene consists of all of the constructs you select; you can make each scene as simple or complex as you want.

When you play back more than one scene in sequence, it becomes a *program* (also called a *show*). A program or show that continuously repeats is called a *loop* or a *chase*.

Technobeam, Technopro and Technoray always play back all contiguously-programmed scenes in a continuous loop. The loop plays back until you either turn the fixture off or stop scene playback. You must create the scenes contiguously (in other words, scene 1, scene 2, scene 3, scene 4, and so on without skipping a scene) because the fixture automatically repeats when it encounters the first unprogrammed scene.

Stand-alone Operation vs. a Controller

You can use a controller or control device (such as DMX control software), or onboard memory to create and play back scenes, but not both at the same time.

In other words, you cannot create a scene on the fixture and play it back using a controller. You also cannot use a controller at the same time onboard scenes are playing back.

Macros

Each Technobeam, Technoray and Technopro has 28 selectable *macros* that assist in programming and show you how powerful your fixture is. Each macro consists of a unique set of fixture constructs picked for their ability to achieve a dramatic and exciting effect.

You must select the full protocol for the fixture as shown in the card in the back cover of this manual in order to use macros. Be sure to try them by selecting the **MACR** construct.

Preset Playback Options

Technobeam, Technopro and Technoray offer the following two options for use with preset programming:

- **Preset capture:** Use any DMX 512-compatible controller to create a scene(s) that can then be saved into the fixture's own presets and later recalled in stand-alone operation without the controller. The only constructs that *cannot* be captured in this way are crossfade (XFAD) and delay (DLAY); you must configure them manually on each fixture.
- **Synchronized preset playback:** Use one fixture to synchronize playback among all fixtures connected together using DMX 512 data-grade cabling. One fixture must be configured as fixture number 1 or at DMX start channel 1. No controllers can be attached to the link containing the synchronized fixtures. See the section titled "Synchronizing Preset Playback" on page 4-10 for more information.

General Information

This section lists general points you need to keep in mind while you are creating and playing back scenes on the fixture.

Subject to Change

The information in the following sections is based on what was available at the time this addendum went to print; however, all information—particularly constructs and construct values—is subject to change.

Enter and Menu Keys

Whenever you are creating a scene, the <Enter> key *accepts* the current selection, whether that selection is a construct—such as SHUT for the shutter—or a value for a construct, such as OPEN. Each construct value is automatically saved when you press <Enter>.

The <Menu> key moves you back to the previous option or menu *without changing* a value.

MSpeed vs. Fast Changes

Some constructs allow you to choose either fast position selection or position selection set by MSpeed (motor/mirror speed).

A *fast* change means the position selection is completed in the shortest length of time after the wheel starts moving.

An *MSpeed* (motor/mirror speed) change occurs smoothly over the entire MSpeed time value. A table of MSpeed times is shown in Appendix A of the user manual.

Selecting Constructs and Values

The step-by-step example in the next section suggests particular constructs and values that will give you an idea of how the fixture works. You can choose different constructs or values if you want using the information in the *Technobeam Quick Reference Card*.

Creating a Scene

This step-by-step example involves the following basic steps:

- Positioning and powering on the fixture
- Turning on the lamp
- Opening the shutter
- Focusing on a litho
- Selecting color and effects options
- Enabling preset playback

Orienting and Powering On the Fixture

1. Orient (physically position) the fixture so the light will be projected onto a flat, light-colored object such as a white wall or ceiling. If you have Technobeam, you will be able to move the mirror to a suitable position.
2. Follow the instructions in Chapter 1 to connect the fixture to an appropriately-rated power outlet, if you have not already done so. (There is no power switch.) Wait for the fixture to finish homing (the gears and motors stop moving).

Turning on the Lamp

1. Press and hold the <Menu> key until **ADDR** appears in the LED display.

   Note If you are already in the menu system, keep pressing (but do not hold down) the <Menu> key until **ADDR** is displayed.

   If **MENU** is displayed, press the <Enter> key to view the **ADDR** option.

2. Use the <Up> and <Down> arrow keys to navigate to the **TEST** menu.

3. Press <Enter>, then use the <Up> and <Down> arrow keys to navigate to the **LAMP** option.

4. Press <Enter>, then use the <Up> and <Down> arrow keys to select **ON**.
5. Press <Enter>. The lamp is now ON, although it might not be visible because the dim flags (also called *shutter* or *light gate*) are closed.

Opening the Shutter

If you are programming either a fixture or a scene that has not already been programmed, skip to the next section.

1. Keep pressing the <Menu> key until **ADDR** appears in the LED display.

2. Use the <Up> or <Down> arrow keys to navigate to the **PRST** menu.

3. Press <Enter>, then use the <Up> or <Down> arrow keys to select **EDIT**.

4. Press <Enter>; the LED display shows **SCN1** option, indicating you are now creating scene number 1. The procedure that follows does not cover every available construct because each fixture is slightly different.
5. Press <Enter> to begin creating scene 1.
6. If you can see light exiting the fixture, the shutter is already open; skip to the next section.

7. Use the <Up> and <Down> arrow keys to navigate to the **SHUT** construct.

8. Press <Enter>, then press the <Up> and <Down> arrow keys to select **OPEN**.
9. Press <Enter>; light should now be visible through the aperture. If so, see the next section.
10. If no light is visible through the aperture, either the shutter is still closed or the lamp is not on. First look through the aperture (*at an angle, not directly*) and make sure the two black dim flags are open, as shown in Figure 4-1. (The two dim flags act as both the dimming

mechanism and as the shutter.)

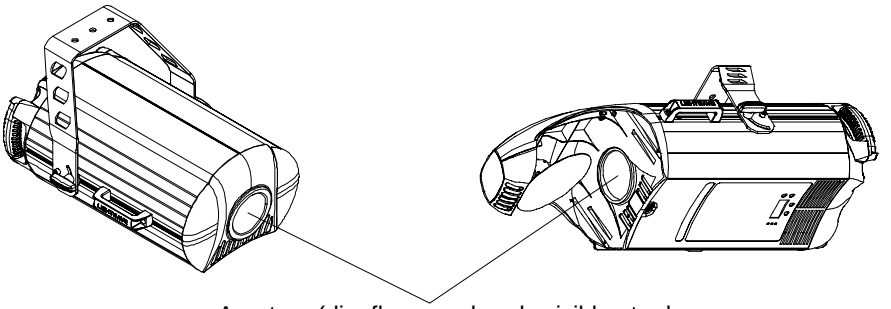

Figure 4-1. Making sure the shutter is open.

11. If the flags are closed, repeat this procedure.
12. If the shutter is open and no light is exiting the fixture, the lamp is off. (The lamp is automatically turned off after a period of no activity.) In that case, turn the fixture OFF, wait a few minutes, then repeat the procedure in the section titled "Turning on the Lamp" on page 4-5.

Positioning the Mirror (Technobeam Only)

PAN

1. Use the <Up> and <Down> arrow keys to navigate to the **PAN** construct.
2. Use the <Up> and <Down> arrow keys to move the mirror to the desired location, then press <Enter>.

TILT

3. Use the <Up> and <Down> arrow keys to navigate to the **TILT** construct and press <Enter>.
4. Use the <Up> and <Down> arrow keys to move the mirror to the desired location, then press <Enter>.

Focusing on a Litho

Only Technobeam and Technoray have litho patterns. If you have Technopro, start with Step 5 to focus on the edge of the beam.

LTOC

1. Use the <Up> and <Down> arrow keys to navigate to the **LTOC** (control) construct.

Idx

2. Press <Enter>, then use the <Up> and <Down> arrow keys to select **IDX**.

LTO

3. Press <Enter> to accept your selection, then use the <Up> and <Down> arrow keys to navigate to the **LTO** construct.

4. Press <Enter>, then press the <Up> or <Down> arrow keys to select any litho pattern (except **L 1**, the open position).

5. Press <Enter> to accept your selection, then use the <Up> and <Down> arrow keys to navigate to the **FCUS** construct.
6. Press <Enter>, then use the <Up> and <Down> arrow keys to bring the litho into sharp focus.
7. Press <Enter> when you are finished focusing the fixture.

Selecting Color Wheel Constructs

1. Use the <Up> and <Down> arrow keys to select **COLC** (or **CO1C** if you have Technopro).

2. Press <Enter>, then press the <Up> and <Down> arrow keys to select **RND** (random color selection).
3. Press <Enter>. The color wheel spins and stops on a random position, pausing for a length of time you will set in the next section.

Selecting a Color Wheel Pause Time

1. Use the <Up> and <Down> arrow keys to navigate to the **COL** construct (or **CO1** if you have Technopro.
2. Press <Enter>, then use the <Up> and <Down> arrow keys to select a pause time (the higher the value, the longer the pause time).
3. Press <Enter> to accept your selection.

Second Color Wheel

This section applies to Technopro only.

Select values for the **CO2C** and **CO2** constructs the same way as for the **CO1C** and **CO1** constructs.

Selecting Effects Constructs

1. Use the <Up> and <Down> arrow keys to navigate to the **FX** construct.
2. Press <Enter>, then use the <Up> and <Down> arrow keys to select any effects position other than **FX 1** (open).

3. Press <Enter>, then use the <Up> and <Down> arrow keys to navigate to the **FXR** construct.
4. Press <Enter>, then use the <Up> and <Down> arrow keys to select either a forward or reverse rotation speed.
5. Press <Enter> to save your settings.

Refocusing the Fixture

If you selected the suggested constructs, you should now see a litho pattern being changed by a rotating effect and random color changes. (If you have Technopro, you will not see a litho pattern.) This section shows how you can use the fixture's superior optics to refocus the image.

1. Use the <Up> and <Down> arrow keys to navigate to the **FCUS** construct.
2. Press <Enter>, then use the <Up> and <Down> arrow keys to change the focus. You can focus on the effects wheel, the litho wheel, the color wheel or anywhere in between.
3. Press <Enter> when you are done.

Setting a Delay Time

The DLAY construct determines the length of time scene 1 "plays" before the next scene begins.

1. Use the <Up> and <Down> arrow keys to navigate to the **DLAY** construct.
2. Press <Enter>, then use the <Up> and <Down> arrow keys to select a value of **3.0**. This means that scene 1 will "play" for 3 seconds before moving on to scene 2. (You will not see the effect of the DLAY construct until you play back your programmed scenes.)
3. Press <Enter> to save your setting.

Note The default unit of time is seconds, but you can change the units to either minutes or hours using the **TIME** construct on the PRST menu.

Creating Scene 2

This section shows how to use the convenient scene copy feature to copy constructs and values from scene 1 to scene 2. Scene copy can greatly speed up the time required to program the fixture, especially for scenes that have minor variations in construct values.

1. Keep pressing the <Menu> key to navigate to the **PLAY** option. (The dim flags close when you make this selection, so you will not see any light exiting the fixture; *this is normal*).

2. Use the <Up> and <Down> arrow keys to select **COPY**.

3. Press <Enter>; the display then shows **FROM**.

4. Press <Enter> and select the scene to copy from. The default option is the current scene number. (**F001** indicates you will copy from scene 1.)

5. Press <Enter> to select scene 1 to copy from. The display then shows **TO**.

6. Press <Enter>; the LED display shows the previously-selected scene number. Use the <Up> and <Down> arrow keys to select **T002** (scene 2).
7. Press <Enter> to select scene 2; the LED display shows **COPY**.
8. Press <Enter>. The constructs are copied from scene 1 to scene 2.

9. Keep pressing the <Menu> key to navigate to the **PLAY** option.

10. Use the <Up> and <Down> arrow keys to select **EDIT**.
11. Press <Enter>, then use the <Up> and <Down> arrow keys to select **SCN2**.

12. Press <Enter> and change the **DLAY** construct to a value of **1.0**.
13. Press <Enter> to accept your selection. Make other construct changes, if desired (if you have Technobeam, move the mirror to a different location using the PAN and TILT constructs.)

Playing Back Both Scenes

Turning preset playback ON starts all programmed scenes playing back in a continuous loop. Scenes advance at the rate set by the DLAY construct and continue playing back until you turn preset playback OFF.

If preset playback was enabled when you powered the fixture OFF, preset playback restarts automatically when you power the fixture back ON again. You can disable preset playback at any time by selecting **OFF** from the PLAY menu.

1. Keep pressing the <Menu> key until **PLAY** appears in the LED display. (The Play option allows you to turn preset playback on and off.) The dim flags close when you make this selection, so you will not see any light exiting the fixture; *this is normal*.

2. Press <Enter>, then use the <Up> and <Down> arrow keys to select **ON**.
3. Press <Enter> to start preset playback.

4. Your scene(s) start playing back, starting with scene 1, continuing to the first unprogrammed scene, then returning to scene 1, etc. The LED display should look similar to the one below:

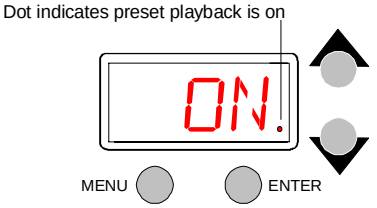

Figure 4-2. A dot always appears in the LED display whenever preset playback is on.

5. To turn preset playback off, keep pressing the <Menu> key to select the **PLAY** option and press <Enter>.

6. Use the <Up> and <Down> arrow keys to select **OFF** and press <Enter>. That stops preset playback, but leaves the currently-running scene active. Select an unprogrammed scene to return the fixture to its default state (with no scene active).

Synchronizing Preset Playback

Once you have programmed one or more scenes on Technobeam, Technopro and Technoray fixtures and connected them to a DMX 512 link, you can synchronize preset playback from one fixture as described in this section.

Note Do not put a controller on the DMX 512 link if you want to use synchronized preset playback.

Setting Up the Fixtures

Make sure you do all of the following when you set up the link. More information about setting up a DMX 512 link is shown in Chapter 2 of the user manual.

1. One fixture must be set as fixture number 1 or at DMX start channel 1 as described in Chapter 2. *Make sure no other fixture on the link is configured as fixture number 1 or at DMX start channel 1.*
2. The fixture in Step 1 should be physically the first fixture in the link, as shown in Figure 4-3 on page 4-11. The last fixture in the link must be terminated.
3. You can choose any fixture number or DMX start channel you want for any of the other fixtures on the link. For example, fixture number 2 does not have to be directly connected to fixture number 1.

4. Make sure there are no controllers on the link.
5. Enable preset playback for all fixtures on the link.

   Note After you enable preset playback on the fixture you configured as fixture 1 or DMX start channel 1, the Transmit LED on that fixture will continue flickering yellow until you disable preset playback.

6. The total delay time of all the scenes on the first fixture (fixture number 1 or DMX start channel 1) should be *longer* than the total delay time of all the scenes on any other fixture in the link. Otherwise, not all scenes on all fixtures will finish playing before looping back to scene 1.

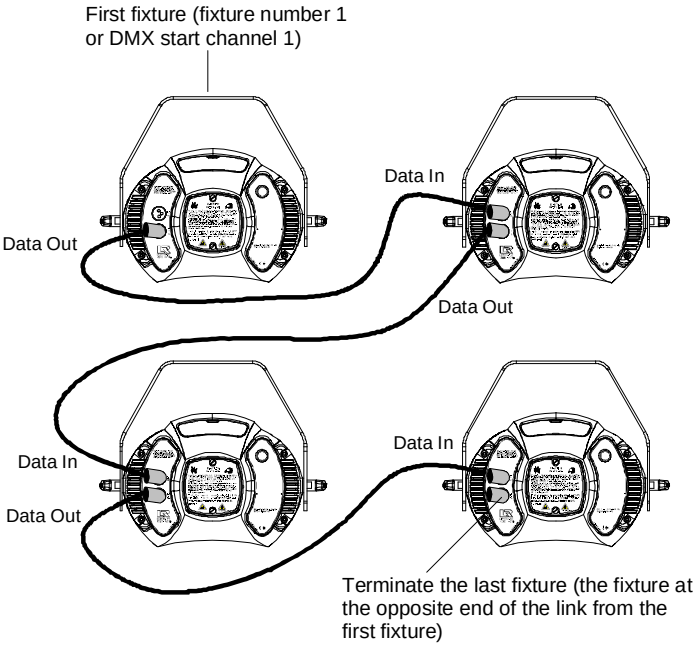
First fixture (fixture number 1 or DMX start channel 1)
Data In
Data Out
Data Out
Data In
Data In
Data Out
Terminate the last fixture (the fixture at the opposite end of the link from the first fixture)

*Figure 4-3. When you set up fixtures for synchronized playback on a DMX 512 link, one and only one fixture **must be** fixture number 1 or DMX start channel 1. The last fixture on the link must be terminated.*

Adding Fixtures

Once you have started synchronized preset playback on the link, you can add other fixtures to the link anytime you want. A fixture added after synchronized preset playback has begun will start playing the scene most closely matching the timeline set by the first fixture. (It will not necessarily begin with scene 1, and it might begin in the middle of a scene.)

When the first fixture wraps to scene 1, the added fixture also wraps to scene 1 and continues playing its scenes normally according to the scenes' delay times.

Capturing Presets

Preset capturing is a way to automate the creation of scenes on multiple Technobeam, Technopro and Technoray fixtures connected to a DMX 512 link. You use a DMX 512-compatible controller to create a scene, save (*capture*) the scene into a fixture's presets and later play back the scene without the controller.

This procedure assumes you are already familiar with your controller; if not, consult the controller's documentation. It also assumes you have some familiarity with using the menu system on Technobeam, Technopro, and Technoray; if not, review Chapter 3 and this chapter.

1. Connect a DMX 512 controller and Technobeam, Technopro and Technoray fixtures on a DMX 512 link as described in Chapter 2.
2. Make sure all Technobeam and Technoray fixtures are configured for their respective full protocols (**TB F** from the Mode menu for Technobeam, or **TR F** for Technoray. Technopro has only one protocol.) Selecting the full protocol takes advantage of all constructs available on the fixture.
3. Create a scene on the controller. The DMX protocols for Technobeam, Technopro and Technoray are listed in Appendix A.
4. Make sure all construct values on the controller are constant. There cannot be any mirror movement or scene-to-scene sequencing.
5. Go to the first fixture you want to store the scene on.

6. Navigate to the **PRST** menu.

7. Press <Enter>, then use the <Up> and <Down> arrow keys to navigate to the **CAPT** option.

8. Press <Enter>, then use the <Up> and <Down> arrow keys to select a scene to capture to. If you select **SCN2**, as shown, you will capture DMX data from the controller into the fixture's scene 2.

9. Press <Enter>. The scene created on the controller is now stored in the selected scene number.
10. You will need to manually select values for the XFAD and DLAY constructs, since the controller does not transmit those constructs.

    Note If the scene you captured to was previously programmed, you will need to make that scene active in order to view the newly-captured scene for the first time. (To make the scene active, select the scene number from the **EDIT** menu.)

11. Repeat the procedure for each fixture you want to capture presets to.

Chapter 5
Using the Technobeam™ Laser Aiming Device™

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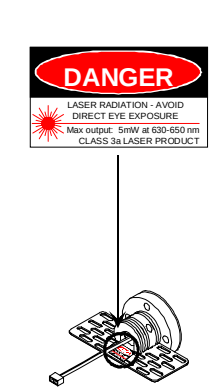
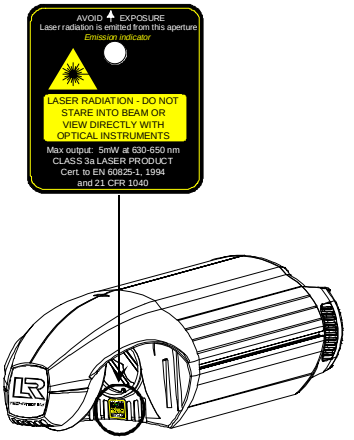
Safety Precautions

This section lists precautions you must follow anytime you are using the Laser Aiming Device (LAD) for Technobeam.

1. CAUTION: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
2. Using the Laser Aiming Device with any fixture other than Technobeam may result in damage to both the laser and the fixture as well as exposure to laser radiation.
3. Do not point the laser at an audience.
4. Precautions should be taken to ensure that the laser beam is not unintentionally directed at mirror-like (specular) surfaces (most importantly, at flat mirror-like surfaces).
5. Only qualified and trained employees approved by a laser safety officer should be assigned to install, adjust and operate the laser equipment.
6. When not in use, the laser (fixture) should be stored in a location where unauthorized personnel cannot gain access.
7. *Do not remove* the labels shown at the bottom of this page; they are required by U.S. and European safety agencies.
8. Areas in which this product is used should be posted with a standard laser warning sign.
9. Do not stare directly into the beam and do not view the beam with optical instruments.
10. The laser path should be located well above or below eye level.
11. The laser beam should be terminated at the end of its useful path.
12. Consult local and state laws regarding laser use and possible registration requirements.



Laser aiming device assembly (inside fixture)


AVOID EXPOSURE
Laser radiation is emitted from this aperture
Emission indicator
LASER RADIATION - DO NOT STARE INTO BEAM OR VIEW DIRECTLY WITH OPTICAL INSTRUMENTS
Max output: 5mW at 630-650 nm
CLASS 3a LASER PRODUCT
Cert. to EN 60825-1, 1994
and 21 CFR 1040

Overview

The Laser Aiming Device (LAD) for the Technobeam™ automated luminaire makes it easy for you to position the mirror during daylight or high ambient light conditions. This in turn allows you the additional flexibility to set up or verify mirror preset positions in conditions that would otherwise make positioning difficult or impossible.

Recommended Laser Operation

The most effective and efficient way to use the laser aiming device is with the fixture's lamp off and dim flags (shutter) closed. There are three reasons for this:

- The higher the temperature, the shorter the life of the laser aiming device. Keeping the lamp off minimizes the temperature inside the fixture, extending the life of the laser.
- The higher the temperature, the less bright the laser will be. If the fixture operates (with the lamp on) at 40°C (104°F) for example, laser power will be decreased by about 25%.
- Technobeam was designed so the laser light can exit the fixture with the dim flags (shutters) closed or completely open. At certain intermediate dim flag positions, the laser light might be partially blocked.

Intended Audience

Only qualified and trained employees approved by a laser safety officer should be assigned to install, adjust and operate the laser equipment.

Using the Laser Aiming Device

You can control the laser using either the fixture's onboard programs, the Technobeam LCD controller, or any DMX 512-compliant controller as shown in the section titled "Controlling the Laser" on page 5-5.

The laser exits the fixture through the same aperture as the light beam, as shown in Figure 5-1. Technobeam was designed so that the laser is visible if the dim flags are completely closed or open.

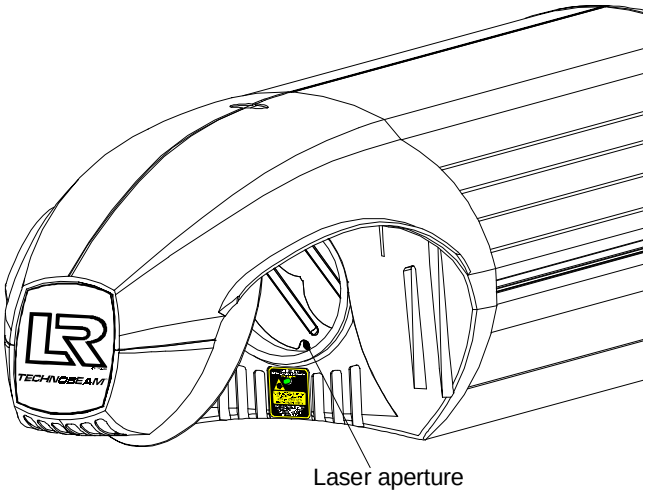


Figure 5-1. The laser light exits the through the same aperture as the light beam.

The laser should ideally be no more than 2" (5 cm) directly above the center point of a perfectly round light beam, as shown in Figure 5-2:

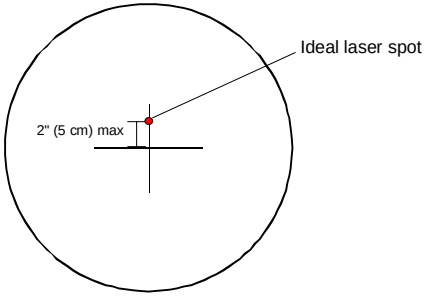


Figure 5-2. The ideal position of the laser is no more than 2" (5 cm) directly above the center point of a perfectly round light beam.

In its ideal position, the laser path is parallel to the path of the light and will stay 2" (5 cm) above the center point of the beam at any throw distance or mirror position.

If the laser becomes out of position, you might need to align it as shown in the section titled "Technobeam™ Laser Aiming Device™" on page 6-20.

However, the decision of whether or not to align the laser is entirely up to you. If the laser strays from its optimal position, but it gives you enough accuracy for your needs, you do not *have to* align it.

Controlling the Laser

You can control the laser in one of three ways:

- **The fixture's menu system:** Edit one of the fixture's eight onboard presets (scenes) using the PRST menu as described in the next section.
- **Any DMX 512-compliant controller:** See the section titled "DMX Control of the Laser" on page 5-5.
- **The Technobeam LCD controller:** See the controller's user manual.

Menu Control of the Laser

Use the PRST menu to create scenes (presets) including the laser aiming device. You access the LAD using the **MACR** construct from the PRST menu.

The complete list of options controlling the laser aiming device (with the MACR construct) is shown below:

- **LROF**: laser aiming device OFF
- **LRON**: laser aiming device ON continuously
- **LM01 to LM30**: laser modulation levels. **LM01** is "slow" modulation at 4.25 times/sec and **LM30** is "fast" modulation at 255 times/sec.

DMX Control of the Laser

This section explains how to control the laser using a DMX 512-compatible controller.

1. Select a fixture number or DMX start channel for each fixture you wish to control as described in Chapter 2.
2. Make sure you select the Technobeam full 18-channel protocol (**TB F** from the Mode menu); otherwise, the laser aiming device will not function.
3. Connect the fixtures to the controller as described in Chapter 2.
4. See Appendix A for details of DMX 512 control (channels 17 and 18 in Technobeam full protocol as shown in Table A-1 on page A-4).

If laser fails to illuminate, the most likely reasons are lack of power or a failed laser.

Laser gradually loses power

This is normal; over time, the laser will gradually lose power until it finally dims out entirely. If this is happening, contact High End Systems Customer Service in one of the ways shown in "Getting Help" on page Intro-4.

Laser is out of position

Align the laser as shown in the section titled "Technobeam™ Laser Aiming Device™" on page 6-20.

Emission Indicator LED OFF, Laser OFF

The laser circuit board is not receiving power.

1. Unplug the fixture and remove the access door shown in Figure 5-3:

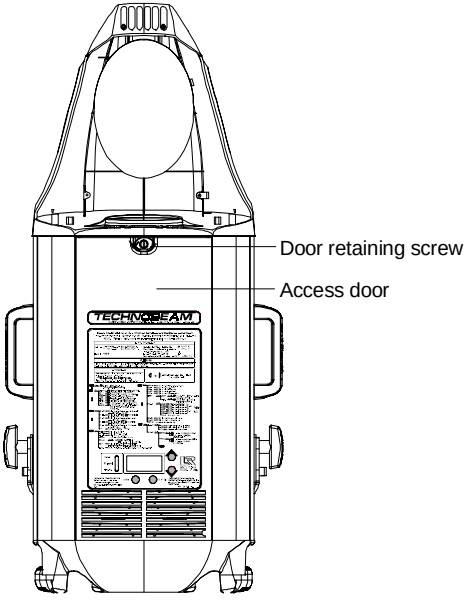


Figure 5-3. Removing the access door.

2. Check all wiring connections shown in Figure 5-4:

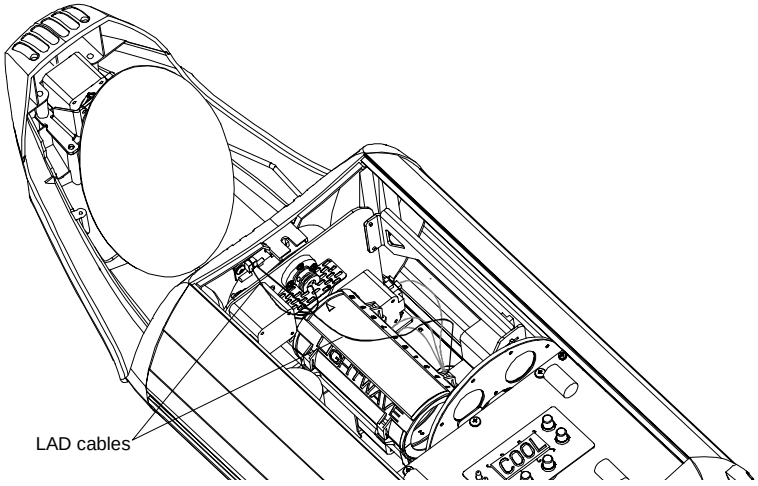


Figure 5-4. LAD wiring connections.

3. Check to make sure the cable labeled "LAD" is connected to the main circuit board (with the LED display).
4. Replace the access door, plug the fixture in and make sure you have enabled the laser as shown in the section titled "Controlling the Laser" on page 5-5.
5. If the Emission Indicator LED and laser are both still OFF, contact High End Systems Customer Service in one of the ways shown in "Getting Help" on page Intro-4.

Emission Indicator LED ON, Laser OFF

1. The laser aiming device assembly is not receiving power. Check the connection at the laser aiming device circuit board, shown in Figure 5-5.

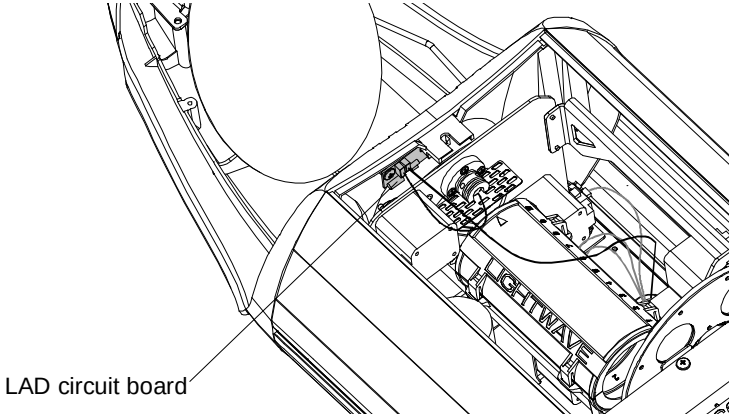


Figure 5-5. The laser aiming device circuit board.

2. If the cable connections are good, contact High End Systems Customer Service in one of the ways shown in "Getting Help" on page Intro-4.

Laser ON, Emission Indicator LED OFF

The most likely reason is a faulty Emission Indicator LED. Contact High End Systems Customer Service as shown in "Getting Help" on page Intro-4.

Maintenance

The only laser maintenance procedure is alignment, which is covered in the section titled "Technobeam™ Laser Aiming Device™" on page 6-20.

Chapter 6
Servicing Your Fixture

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Precautions

This section lists precautions you must follow anytime you are servicing the fixture.

WARNINGS

Before performing any service or maintenance, make note of the following:

(1) Hot lamp may be an explosion hazard. Do not open for 5 minutes after switching off. Wear eye and hand protection when re-lamping.

(2) Equipment surfaces may reach temperatures up to 70° C (158° F). Allow 5 minutes for cooling before handling.

(3) Disconnect power before re-lamping or servicing.

(4) Replace fuses with the specified type and rating *only*.

(5) Never look directly at the lamp while lamp is on.

(6) The procedures in this chapter are intended to assist qualified service personnel because Technobeam, Technopro and Technoray fixtures are to be serviced by qualified service personnel *only*.

Replacing Fuses

This section explains how to replace any of the three fuses located on the fixture's circuit board. Make note of the warnings in the section titled "Precautions" on page 6-2.

Table 6-1. Replacement Fuses

Fuse	Amps	Volts	Fuse Type
F1	4.0 A	125 V	Fast Blow Only
F2	2.5 A	250 V	Fast Blow Only
F3	6.3A	250 V	Slow Blow Only

Note All fuses are 5 mm x 20 mm.

Table 6-2 describes the typical failure symptoms of each of the fuses:

Table 6-2. Fuse Failure Symptoms

Fuse	Protects	Symptoms of Failure
F1	Motor power	Motor LED is OFF when fixture is receiving power. Receive LED might be ON. Motors and gears will not move, lamp is OFF.
F2	Logic power	Fixture shuts down, LEDs might be ON.
F3	Main fuse	Fixture shuts down, LEDs are all OFF.

1. Unplug the fixture from the power supply.
2. Lay the fixture on its back and locate the door retaining screw, as shown in Figure 6-1:

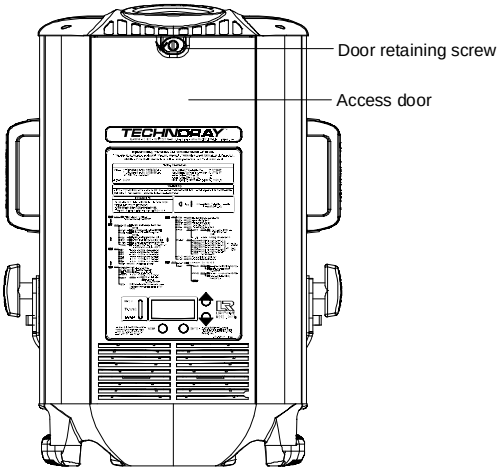

Figure 6-1. Removing the door allows you to access the fixture's voltage selection switches and fuses, as well as wheels and optics.

3. Note which fuse(s) needs to be replaced and make sure you replace it with a fuse of the same type and rating, as shown in Table 6-2 on page 6-3.

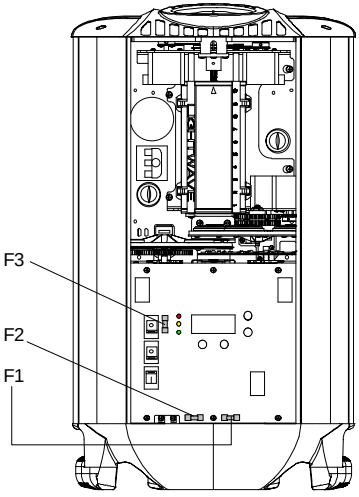

Figure 6-2. Locations of the three fuses on the Technopro or Technoray circuit board.

4. Replace the access door and connect the fixture to a power supply. You are finished.

Replacing Wheel Components

This section explains how to remove and replace individual components in the wheels. Follow the precautions listed in the section titled "Precautions" on page 6-2.

Always heed the following precautions when handling and using dichroics, lithos and effects:

- **Avoid touching the coated side of the glass. Handle the edge or uncoated side of the glass when removing or installing lithos. If possible, wear cloth gloves when inserting and removing lithos from the litho wheel housing.**
- **If necessary, clean the lithos with a mild glass cleaner and a soft cloth.**

Specifications

You can install any High End Systems-manufactured solid dichroic filters, effects, LithoPatterns lithos, ArtGlass, or Fusion Fire®—as long as they were manufactured for use with Technobeam, Technopro or Technoray and not another fixture.

You can also install dichroics, gobos, lithos or effects from other manufacturers as long as they adhere to the following specifications:

Dichroics

- Diameter: 1.2" ± 0.010" (30 mm ±0.25 mm)
- Thickness: 0.069" ± 0.010" (1.8 mm ±0.25 mm)

Lithos

- Diameter/image area: 0.996"/0.860" ± 0.005" (25 mm/22 mm ±0.13 mm)
- Maximum thickness (rotating litho only): 0.105" ± 0.005" (2.7 mm ±0.13 mm)
- Thickness (static litho only): 0.069" ± 0.010" (1.8 mm ±0.25 mm)

Rotating effects

- Diameter/image area: 1.43"/1.04" ± 0.010" (36 mm/26 mm ±0.25 mm)
- Maximum thickness: 0.175" (4.4 mm)

Reference Drawings

Figure 6-3 and Figure 6-4 show the location of each wheel in the Technobeam, Technopro and Technoray fixtures.

Figure 6-3 shows Technoray. Technobeam is identical except it has a mirror head instead of a static projection bezel:

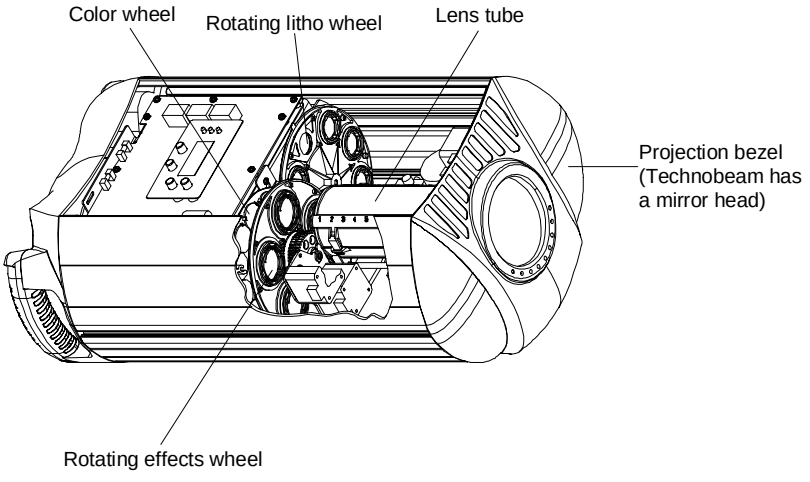

Figure 6-3. Location of the wheels in Technoray and Technobeam.

Figure 6-4 shows Technopro:

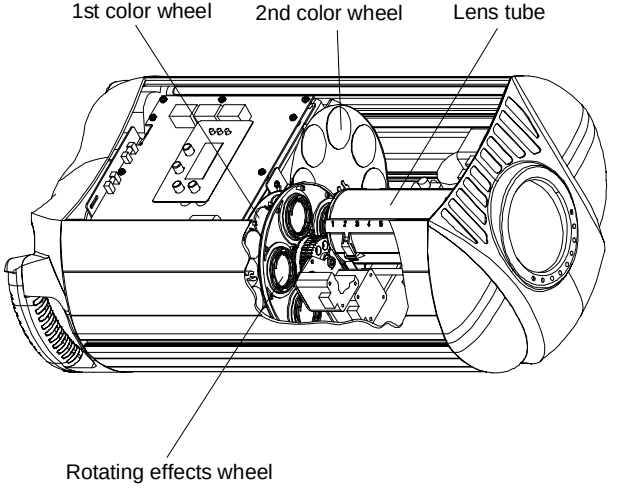

Figure 6-4. Location of the wheels in Technopro.

Replacing Dichroics in the Color Wheel

This section shows how to change individual dichroic filters in the color wheel. You can replace dichroics if they are damaged or broken, to change the order in their respective wheels, to clean them, or to add new ones. (See the section titled "Optional Accessories" on page 1-6 for ordering information.)

1. Manually turn the wheel so the dichroic you wish to replace is easy to access.
2. Push the dichroic you wish to replace toward the center of the wheel to free it from the two wheel tabs as shown in Figure 6-5.

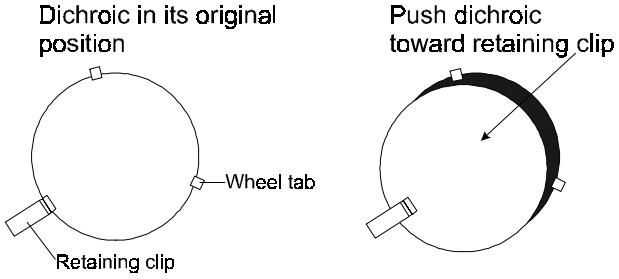

Figure 6-5. Push the dichroic toward the large retaining tab to free it from the wheel tabs.

3. Once the dichroic is free of the two wheel tabs, pull it out of the wheel. If you intend to reuse this dichroic, put it in a safe place where it will not get scratched.
4. Clean the dichroic, if necessary, with a mild glass cleaner (*containing no ammonia)* and a soft, lint-free cotton cloth.
5. Carefully install the replacement dichroic, oriented so the coated side is facing *toward the lamp* and the uncoated, glass side is facing toward the rotating litho wheel.

   To determine which side is coated, place the tip of a pen against each side of the dichroic. Look at the dichroic and pen from a slight angle. On the coated side, the tip of the pen appears to "touch" its reflection. On the uncoated side, there appears to be a gap between the pen and

its reflection (see Figure Figure 6-6).

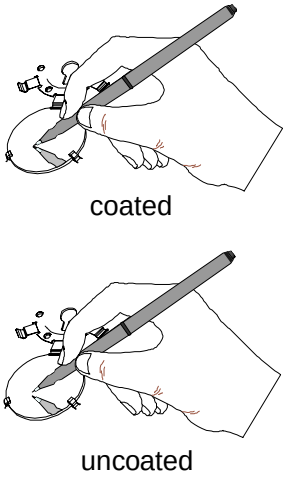

Figure 6-6. You can easily tell which side of a dichroic is coated by placing a pen or other object near the surface; on the coated side, the reflection from the object will appear to touch the object.

6. Install the new dichroic into its wheel by pushing it under the large retaining clip, then pull it up so it fits under the wheel tabs. Repeat the procedure for each dichroic you wish to replace.
7. Replace the access door shown in Figure 6-1 on page 6-4 unless there are other dichroics, lithos or effects you want to replace.

Replacing Lithos in the Rotating Litho Wheel

This section explains how to replace either of the two lithos in each position on the Technobeam or Technoray rotating litho wheel: the *rotating litho* (facing the rotating effects wheel) and the *static litho* (directly behind the rotating litho).

You can replace lithos if they are damaged or broken, to change the order in their respective wheels, to clean them, or to add new ones. (See the section titled “Optional Accessories” on page 1-6 for ordering information.)

Removing a Rotating Litho or Rotating Effect

1. Rotate the wheel until the desired litho is easy to access.
2. Make note of the plastic tabs built into the wheel, as shown in Figure 6-7.

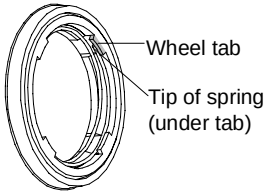

Figure 6-7. The rotating litho wheel and rotating effects wheel have built-in plastic tabs that hold the spring in place.

3. Locate the tip of the metal spring (which should be under one of the tabs). Carefully grasp the tip of the spring with your finger and push it from under the tab.
4. Rotate the spring as you remove it from the housing. Continue pressing the spring under each tab until the spring is completely free of the wheel.
5. Keep the wheel holder in place with one hand and grasp the spring with the other hand. Grasp the spring and carefully pull it free of the housing.
6. Reach in with your finger to remove the litho/effect and aperture ring (if any) from behind the spring.

7. See one of the following:
   a. Rotating litho wheel: "Litho Installation Instructions" on page 6-10.
   b. Rotating effects wheel: "Replacing a Rotating Litho or Effect" on page 6-12.

Removing a Static Litho

1. Rotate the wheel until the desired litho is easy to access.
2. Carefully spread the wheel apart and reach behind the wheel to remove

the litho as shown Figure 6-8:

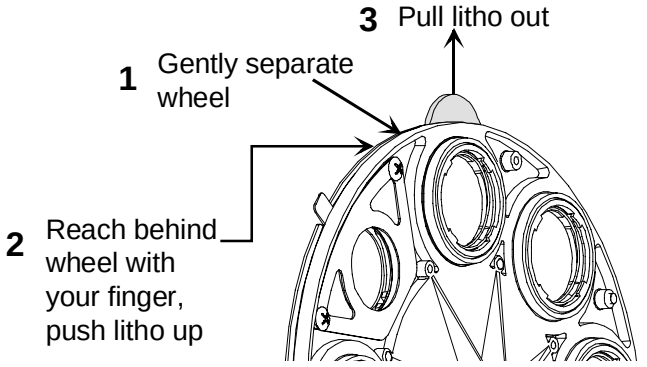

Figure 6-8. To replace a static litho in the rotating litho wheel, gently separate the wheel and reach behind the wheel to push the litho out.

Cleaning the Litho

Clean the litho, if necessary, using a mild glass cleaner (*containing no ammonia)* and a soft, lint-free cotton cloth.

Litho Installation Instructions

These instructions apply to installing either a rotating or a static litho in the rotating litho wheel. *Improper installation can result in damage to the litho.*

- **Custom multi-colored lithos in metal holder:** See "Replacing a Custom Litho" on page 6-13.
- **Etched pattern, no texture (LithoPatterns lithos):** the coated side of the litho must face *away from* the lamp; face the uncoated (glass) side toward the lamp.
- **Textured pattern (flat unglazed Art Glass, or Fusion Fire):** the textured side must face *away from* the lamp; face the non-textured (smooth) side *toward* the lamp.

Replacing a Static Litho

1. Carefully handling the litho by its edges only, separate the wheel and drop the litho into the retaining slot and between the two retaining tabs as shown in Figure 6-9:

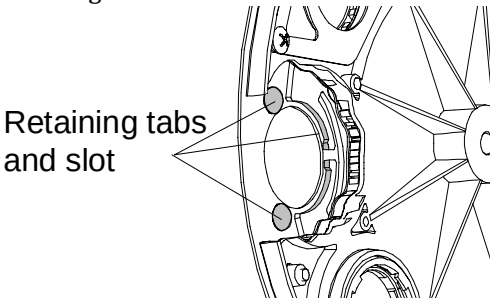

Figure 6-9. Location of the retaining tabs and slot that secure the static litho in the rotating litho wheel.

2. Insert a flat blade screwdriver or other thin object between the two parts of the rotating litho wheel to firmly seat the static litho in the retaining slots shown in Figure 6-9. *Avoid touching any part of the glass with your fingers.*

   a. Examine the gap between the two parts of the rotating litho wheel; if the gap is uniform along the entire edge of the wheel, you are finished.

   b. If the gap is not uniform, continue seating the static litho until the gap is uniform.

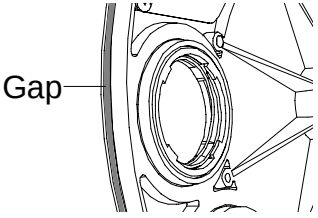

Figure 6-10. The gap between the two halves of the rotating litho wheel must be uniform.

Replacing a Rotating Litho or Effect

1. Carefully handling the litho/effect by its edges only, orient it as shown when you replace it:
   a. **Rotating litho wheel:** "Litho Installation Instructions" on page 6-10.
   b. **Rotating effects wheel:** Orient the textured side of the effect *away from* the lamp. If the effect does not have a texture (e.g., the frost filter, orientation is not important).
2. If the litho/effect you are installing or replacing has an aperture ring, put the aperture ring on top of the litho. See Figure 6-11.

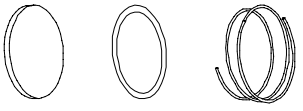

Figure 6-11. An aperture ring, if required, must be placed on top of the litho/ effect and under the spring.

3. Carefully replace the spring, turning it as you compress it, until the spring is fully seated in the litho holder. *Make sure the spring fits completely under all wheel tabs and that the tip of the spring does not protrude from under the tabs.* See Figure 6-12:

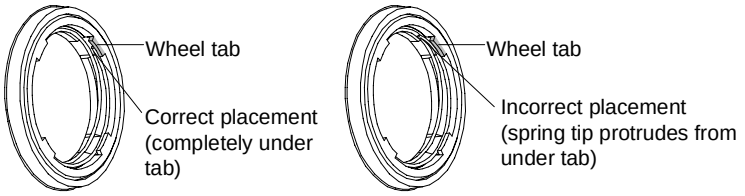

Figure 6-12. When you replace a rotating litho or rotating effect, make sure the tip of the spring is fully seated under the wheel tabs; it cannot protrude from under the tabs.

4. You are finished. Replace the access door shown in Figure 6-1 on page 6-4 unless there are other dichroics, lithos or effects you want to replace.

Replacing a Custom Litho

If you received a custom, multi-colored litho in an aluminum holder, you must install it with the litho facing toward the lamp (i.e., the flat side of the holder against the spring), as shown in Figure 6-13. *Improper installation can damage the litho!*

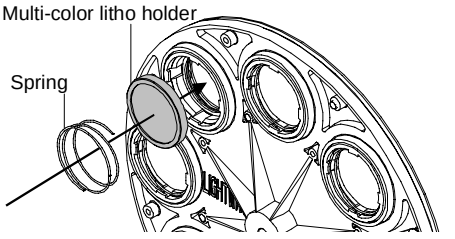

Figure 6-13. Replacing a custom multi-colored litho in the metal holder.

Replacing the Lamp

You will need:

– 250 watt, GX9.5 base, M series metal halide lamp only
– Eye protection
– Protective gloves

WARNINGS

(1) This equipment is designed for use with Philips® M series, GX9.5 base, 250 watt lamp only. Use of any other type lamp may be hazardous and may void the warranty.

(2) Change the lamp if it becomes damaged or thermally deformed.

(3) Change shields, lenses or ultraviolet screens if they have become visibly damaged to such an extent that their effectiveness is impaired, for example, by cracks or deep scratches.

(4) Do not operate this equipment without complete lamp enclosure in place or if shields, lenses or ultraviolet screens are damaged.

(5) Hot lamp may be an explosion hazard. Do not open for 5 minutes after switching off. Wear eye and hand protection when re-lamping.

(6) Never look directly at the lamp while lamp is on.

(7) Disconnect power before re-lamping or servicing.

1. Unplug the fixture from the power source.
2. Fully back out the two lamp assembly screws shown in Figure 6-14.

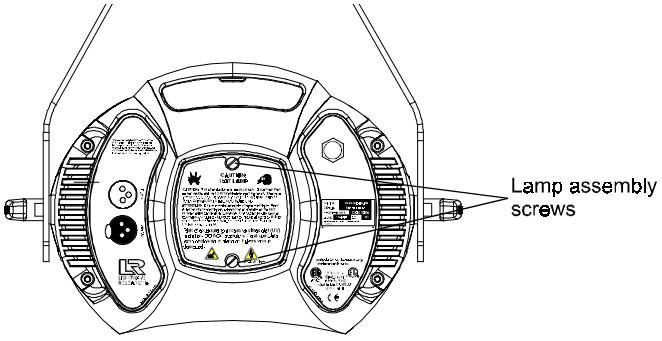

Figure 6-14. Loosening the lamp assembly screws gives you access to the fixture lamp.

3. *Put on your eye and hand protection.* Pull the lamp assembly straight out of the back of the fixture as shown in Figure 6-15.

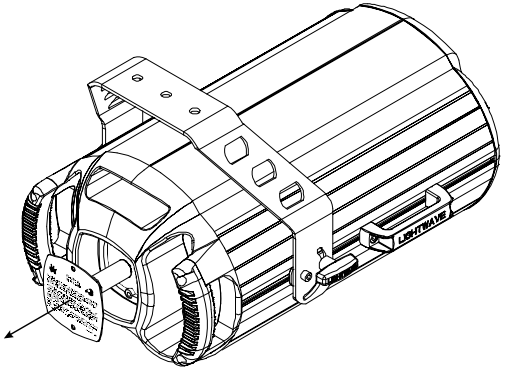

Figure 6-15. Removing the lamp assembly from the fixture.

4. If you are replacing a lamp, grasp the lamp's ceramic base and pull the old lamp straight up and out of the assembly when the assembly is free of the fixture, as shown in Figure 6-16:

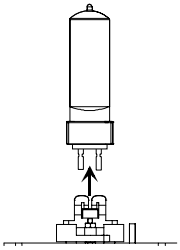

Figure 6-16. Pull straight up on the lamp, grasping its ceramic base, to remove it from the assembly.

5. Take the new or replacement lamp out of its container. Break the seal on the inner plastic container and remove the lamp.

6. Hold onto the ceramic lamp base and gently press the two lamp base pins into the brass lamp socket as shown in Figure 6-17. *Do not force the lamp into the socket; doing so could break the lamp.*

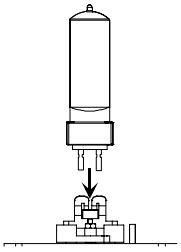

Figure 6-17. Hold the lamp by its ceramic base and gently press the two base pins into the socket.

Caution **Avoid touching any part of your skin to the lamp's quartz envelope. Oil and residue from your fingers can create a "hot spot" on the lamp, causing premature lamp aging.**

7. Before you insert the lamp assembly back into the fixture, clean the lamp with the alcohol wipe shipped with the lamp. Otherwise, fingerprints and other contaminates can shorten lamp life.

8. Carefully guide the lamp assembly straight back into the fixture. Make sure the lamp plate is oriented correctly, as shown in Figure 6-18; otherwise, the lamp power wires could wrap around the lamp, resulting in damage to the fixture and the lamp.

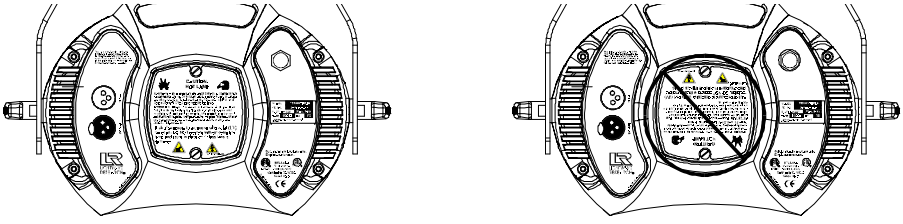

Figure 6-18. You can look at the lamp label text to make sure the lamp plate is oriented correctly; incorrect orientation can result in damage to the fixture and the lamp.

9. As you insert the lamp assembly, be careful not to crimp or trap the lamp wires and make sure the lamp is inserted into the reflector.
10. Firmly tighten the two lamp assembly screws to secure the assembly to the fixture.

Resetting Lamp Hours

After changing a lamp, you should reset the number of lamp hours to zero by selecting **L/RS** from the Info menu. See the menu system help card inside the back cover of this manual, or consult Chapter 3 if you need additional help using the menu system.

Cleaning the Internal Components

Before continuing, read the cautions and warnings in the section titled "Precautions" on page 6-2.

You will need: ***- a soft, lint-free cotton cloth***
- mild glass cleaning solution
- warm soapy water

Opening the Fixture

Unplug the fixture from the power outlet and allow it to cool for at least 5 minutes if it has been running recently. Remove the access

door shown in Figure 6-19:

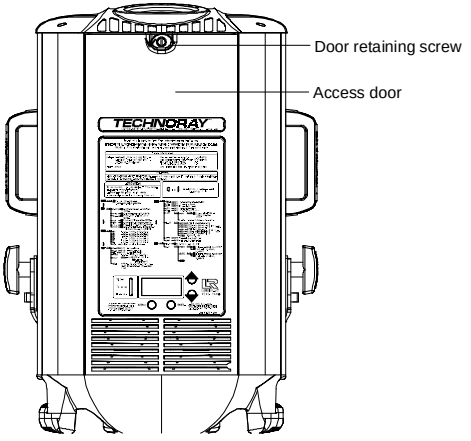

Figure 6-19. Opening the fixture's access door.

Cleaning the Door Vents

Once the door is removed, use a soft, lint-free cotton cloth and warm soapy water if necessary to clean dust and dirt from the inside and outside of the vents shown in Figure 6-19.

Cleaning the Lenses and Mirrors

1. If you need to move the lens tube so you can access the anti-reflective glass, reach under the lens tube and turn the focus drive screw (see Figure 6-20).
2. Clean both sides of the anti-reflective glass (shown in Figure 6-20) with

a soft, lint-free cotton cloth and mild glass cleaning solution.

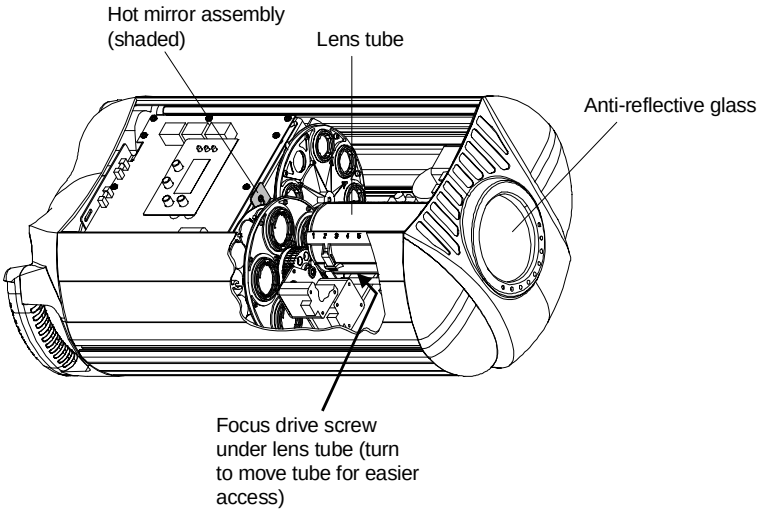

Figure 6-20. Location of the anti-reflective glass, lenses and hot mirror.

3. If the black dim flags (located between the lens tube and the anti-reflective glass) are closed, carefully use your fingers to open them to clean the inside of the glass.
4. Locate the lens tube as shown in Figure 6-21:

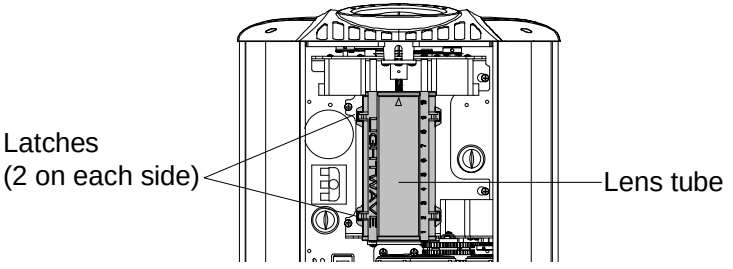

Figure 6-21. The lens tube contains the zoom lenses.

5. Carefully lift the cover from the lens tube. It has two latches on each side that secure it in place.
6. Write down the position of each of the lenses in the lens tube. (Each position is numbered both on the lens tube cover and on the inside of the lens tube.)
7. Handle each lens carefully by its edges only. Use a soft, lint-free cloth to clean the lenses. If necessary to remove built-up dirt and dust, use a mild glass cleaner (*containing no ammonia*).
8. Replace the lenses in the lens tube in the same positions as you removed them. Refer to Table 1-2 on page 1-16 or Table 1-3 on page

1-16 for reference.

9. Replace the cover on the lens tube. Make sure all four latches are fastened securely.
10. Use a Phillips screwdriver to loosen (but do not remove) the screw on the hot mirror tab, shown in Figure 6-20 on page 6-18.
11. Carefully remove the hot mirror assembly. Inspect the hot mirror (shown in Figure 6-22) for cracks, deep scratches or other damage. If you notice significant damage, High End Systems Customer Service in one of the ways shown in the section titled “Getting Help” on page Intro-4.

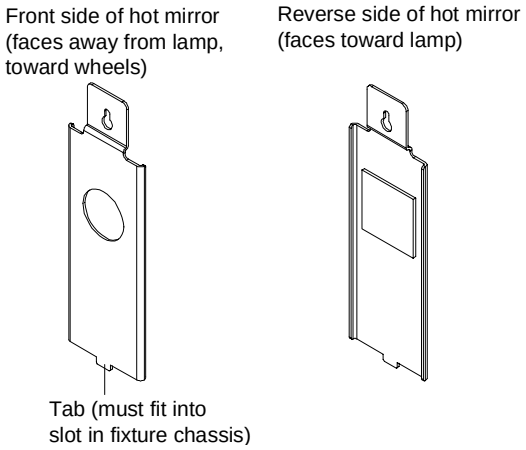

Figure 6-22. Clean both sides of the hot mirror glass.

12. Clean both sides of the hot mirror with a soft, lint-free cotton cloth.
13. Orient the hot mirror as shown in Figure 6-22.
14. When you replace the hot mirror assembly, make sure the tab shown in Figure 6-22 fits into a slot on the fixture chassis. When the tab is properly seated, you will be able to push the hot mirror down until the small end of the keyhole-shaped slot touches the Phillips screw.
15. *Technobeam only:* Clean the elliptical mirror on the mirror head with a cloth soaked in warm, soapy water.
16. You are finished. Replace the access door shown in Figure 6-1 on page 6-4.

You might need to realign the laser periodically in order to maintain its optimal position—no more than 2" (5 cm) directly above the center point of the light beam. If you align the laser in this way, the path of the laser is parallel to the path of the light and will stay 2" (5 cm) above the center point of the beam at any throw distance or mirror position.

You align the laser using the three mounting/alignment screws shown in Figure 6-27 on page 6-26.

However, the decision of whether or not to align the laser is entirely up to you. If the laser strays from its optimal position, but it gives you enough accuracy for your needs, you do not *have to* align it.

Figure 6-23 shows the ideal position of the laser from the center of a perfectly round light beam:

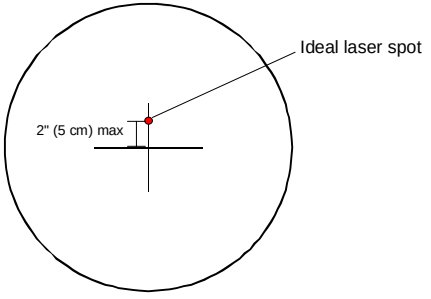

Figure 6-23. The ideal position of the laser is no more than 2" (5 cm) directly above the center of a perfectly round light beam.

Safety Precautions

In addition to observing all of the cautions in the section titled "Precautions" on page 6-2, you must observe the following cautions whenever using or servicing the Laser Aiming Device (LAD):

1. CAUTION: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
2. Using the Laser Aiming Device with any fixture other than Technobeam may result in damage to both the laser and the fixture as well as exposure to laser radiation.
3. Precautions should be taken to ensure that the laser beam is not unintentionally directed at mirror-like (specular) surfaces (most

importantly, at flat mirror-like surfaces).

4. Only qualified and trained employees approved by a laser safety officer should be assigned to install, adjust and operate the laser equipment.
5. When not in use, the laser (fixture) should be stored in a location where unauthorized personnel cannot gain access.
6. Do not stare directly into the beam and do not view the beam with optical instruments.
7. The laser path should be located well above or below eye level.

   The section titled “Safety Precautions” on page 5-2 has a complete listing of safety precautions for using the Laser Aiming Device.

Live Components

You will be accessing live components and adjusting the laser in the next section. Take special care to avoid contacting high-voltage live components, located in the area of the main circuit board, shown in Figure 6-24:

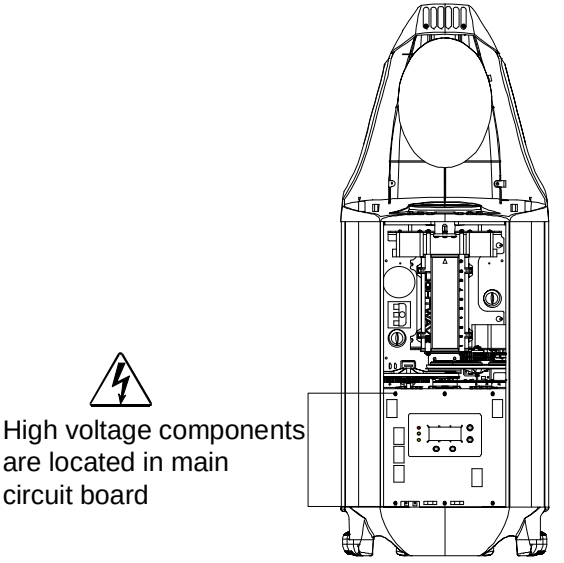

Figure 6-24. High-voltage component location.

When you activate the laser, observe the following precaution:

Caution **Do not stare into the beam or view it directly with optical instruments. Avoid accidental exposure to laser radiation.**

Alignment Procedure

The alignment procedure that follows takes advantage of Technobeam's built-in program storage capability to turn the laser ON.

1. Follow the instructions in Chapter 1 to select a voltage setting and install a power cord cap, if you have not already done so.
2. Physically orient the fixture as shown in Figure 6-25 (the farther away the wall is, the more accurate your positioning will be):

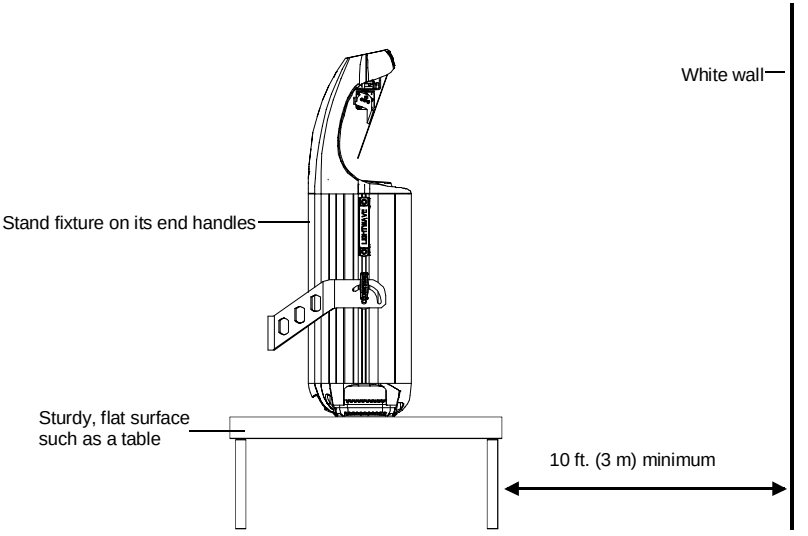

Figure 6-25. Orient the fixture directly facing a wall no less than 10 ft. (3 m) away.

3. Connect the fixture to an appropriately-rated power outlet. You will hear sounds as wheels and motors seek their home positions; *this is normal*.

4. When the fixture has finished homing, press and hold the <Menu> key until the LED display reads **ADDR**.

The next steps show how to turn the lamp ON.

5. Use the <Up> and <Down> arrow keys to navigate to the **TEST** menu.

6. Press <Enter>, then use the <Up> and <Down> arrow keys to navigate to the **LAMP** option.
7. Press <Enter>, then use the <Up> and <Down> arrow keys to select a value of **ON**.
8. Press <Enter>; the lamp should now be on (although you will not be able to tell if the dim flags are closed).

The next steps show you how to access the fixture's built-in

programming menu to begin aligning the laser.

9. Keep pressing the <Menu> key until the **ADDR** menu is displayed.

10. Use the <Up> and <Down> arrow keys to navigate to the **PRST** menu.

11. Press <Enter>, then use the <Up> and <Down> arrow keys to navigate to the **EDIT** menu option. The EDIT option allows you to create or edit up to eight scenes which are stored in the fixture's onboard memory.

12. Press <Enter>. Use the <Up> and <Down> arrow keys to select the scene number of an unprogrammed scene. For example, selecting **SCN2** means you will edit scene number 2.
13. Press <Enter> to begin editing the scene you selected.
14. If you selected an unprogrammed scene, skip to Step 17 now; otherwise, continue with the next step. If the fixture started making noises of gears and wheels moving as soon as you selected the scene, and the noises continue for more than a brief period of time, you selected a programmed scene.

    The next two steps show how to unprogram a scene; you need to unprogram the scene in order to make sure all constructs are set to default values. This is necessary only if all eight scenes are already programmed.

15. Use the <Up> and <Down> arrow keys to navigate to the **ZERO** option.
16. Press <Enter>; you will be required to confirm the action by pressing <Enter> again.

    Step 17 through Step 22 shows how to open the shutter and set the dim construct to full bright. You can skip these steps if you can clearly see the light projected onto the wall.

17. Use the <Up> and <Down> arrow keys to navigate to the **SHUT** option.
18. Press <Enter>, then use the <Up> and <Down> arrow keys to select a value of **OPEN**.
19. Press <Enter> to accept your selection.
20. Use the <Up> and <Down> arrow keys to navigate to the **DIM** option.
21. Press <Enter>, then use the <Up> and <Down> arrow keys to select a value of **D255** (full bright).
22. Press <Enter> to accept your selection.

    You should now see the white, round shape of the beam projected onto the wall or white surface.

    - If the beam is round (not oval) in shape, continue with Step 31.
    - If the beam is not round in shape, see the next step.

23. Make sure the fixture is oriented directly at the wall, not at an angle. If the fixture is at an angle to the wall, it might be impossible to align the laser properly.

24. Use the <Up> and <Down> arrow keys to navigate to the **TILT** option.
25. Press <Enter>, then use the <Up> and <Down> arrow keys to adjust the mirror position until the beam is round.
26. Press <Enter> to accept your selection for TILT.
27. If the beam needs further adjustment, use the <Up> and <Down> arrow keys to navigate to the **PAN** option.
28. Press <Enter>, then use the <Up> and <Down> arrow keys to adjust the mirror position.
29. Press <Enter> to accept your selection for PAN.
30. Continue adjusting the mirror using PAN and TILT until the beam is as round as possible.

    If you cannot see the beam at all, the lamp might be off. Select **LAMP** from the Test menu and make sure a value of **ON** is displayed; see Step 5 through Step 8. (If the lamp still does not come on, wait a few minutes and try again.)
31. Use the <Up> and <Down> arrow keys to navigate to the **FCUS** option.
32. Press <Enter>, then use the <Up> and <Down> arrow keys to focus on the edge of the beam until it is sharp.
33. Continue moving the fixture and focusing on the edge of the beam until the beam is as round as possible, and sharply in focus.
34. When you have focused the beam, press <Enter>.

35. Find the approximate center of the beam using either a tape measure, ruler or a piece of string, as shown in Figure 6-26.

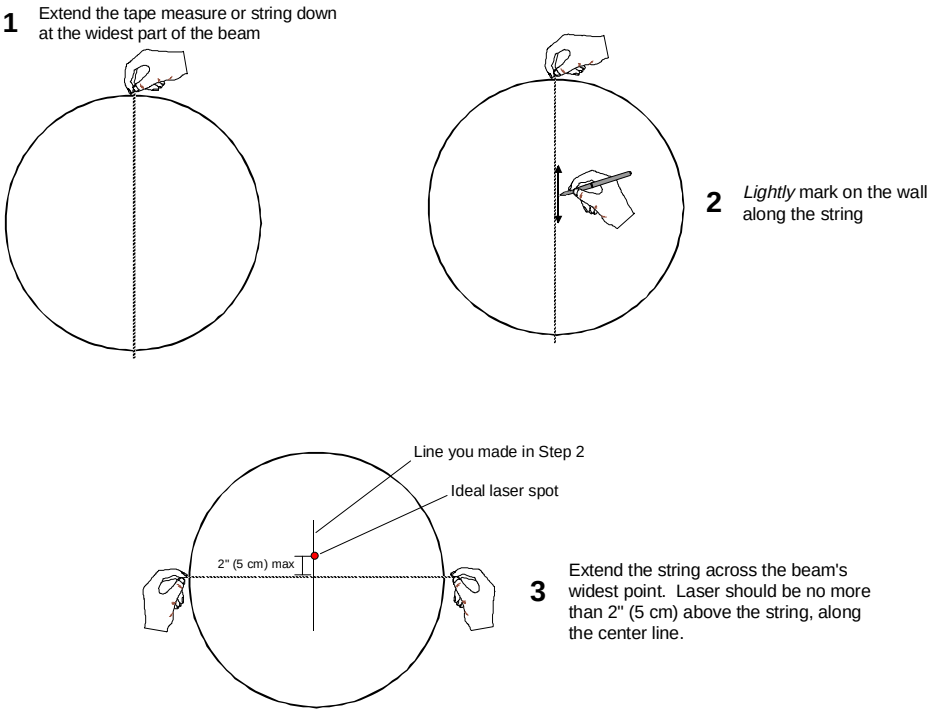
1
Extend the tape measure or string down at the widest part of the beam
2
Lightly mark on the wall along the string
Line you made in Step 2
Ideal laser spot
2" (5 cm) max
3
Extend the string across the beam's widest point. Laser should be no more than 2" (5 cm) above the string, along the center line.

Figure 6-26. Locating the center point of the projected light beam. The laser should be no more than 2" (5 cm) above the center.

36. Once you have marked the center point of the beam, keep pressing the <Menu> key until the **ADDR** option is displayed.

37. Use the <Up> and <Down> arrow keys to navigate to the **TEST** menu.

38. Press <Enter>, then use the <Up> and <Down> arrow keys to navigate to the **LAMP** option.
39. Press <Enter>, then select a value of **OFF**.
40. Press <Enter>. The lamp now shuts off.
41. Keep pressing the <Menu> key until the **ADDR** option is displayed.
42. Use the <Up> and <Down> arrow keys to navigate to the **PRST** menu.
43. Use the <Up> and <Down> arrow keys to navigate to the **EDIT** option.
44. Press <Enter>, then use <Up> and <Down> arrow keys to navigate to the **SCN2** option (this selects scene number 2; select the same scene you selected in Step 12.

Caution **Do not stare into the laser beam or view it directly with optical instruments.**

45. Press <Enter>, then use the <Up> and <Down> arrow keys to navigate to the **MACR** option.

46. Press <Enter>, then use the <Up> and <Down> arrow keys to select **LRON** (laser on continuously).
47. Press <Enter> to accept your selection.
48. Look at the wall where the beam is projected onto to determine if the laser is on.
49. If the laser does not come on, see the section titled "Troubleshooting" on page 5-6; otherwise, continue with the next step.
50. Figure 6-27 shows the 3 mounting/alignment screws located on the laser aiming device assembly. See the instructions that follow the drawing.

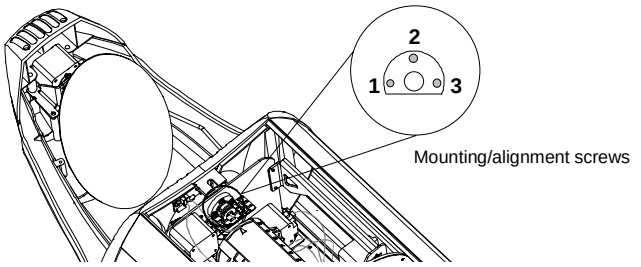

Figure 6-27. The laser aiming device assembly has three screws that can be used to adjust the position of the laser.

Alignment screws 1 and 3 (shown in Figure 6-27) move the laser horizontally, and screw 2 moves the laser vertically. Use the three alignment screws to adjust the position of the laser so that it is no more than 2" (5 cm) directly above the center point of the beam, shown in Figure 6-23 on page 6-20.

51. After you tighten/loosen each screw, release pressure from the screwdriver before looking at the laser position on the wall; having pressure on the screw can change the laser's position. *Do not force the screws or fully tighten them because the ends of the screws might interfere with the dim flags.*

Hint: If you have difficulty aligning the laser or turning the screws, loosen all three screws and start over.

52. Continue repeating the procedure until the laser is aligned. (If you cannot get your laser exactly at position shown in Figure 6-23 on page 6-20, but it is still at a position you think will give you enough accuracy for your needs, you are finished.)
53. When you're finished, replace the access door shown in Figure 6-19 on page 6-17.

Appendix A
DMX Protocols

Channel Boundaries

The DMX 512 protocol provides 512 channels that are divided among all the devices connected to the controller in a particular link. The number of channels that a device uses depends on the requirements and design of the device. In theory, you could have one device that uses 512 channels, two devices that each use 256 channels, four devices that each use 128 channels, up to 512 devices that use one channel each.

Each Technobeam, Technopro or Technoray fixture uses a contiguous block of channels with each block having a unique starting channel. The block of channels assigned to each fixture defines its *channel boundary*. Channel boundaries can start at any channel, even or odd. The exact starting channel depends on the fixture's method of control.

For example, Technopro is on a 12-channel boundary. That means a Technopro fixture set to DMX start channel 1 uses channels 1—11.

Non-Overlapping Boundaries

No two devices on the same DMX link can have overlapping boundaries. In other words, you must reserve for each device the entire range of DMX channels required for that device (for example, 12 channels must be reserved for each Technopro). If boundaries overlap, one or both devices will be disabled or will behave erratically.

The single exception to the non-overlapping rule is if you want two devices to respond to control commands in exactly the same way; in that case, both devices would share an entire DMX channel range.

General Information

The information in this section applies to all of the protocols listed in this Appendix (except where noted).

Rounding Conventions

The values displayed in the columns “Value (dec.)”, “Value (%)” and “Value (hex)” in the following tables may vary slightly depending on your controller’s rounding convention.

16-Bit Control

The full protocols for Technobeam and Technoray give you 16-bit control over the positioning of the mirror (Technobeam only) and the angular position of rotating lithos. However, you always have smooth, 16-bit control over *movement*, even if you choose the reduced protocol—which gives you 8-bit control over mirror and litho positioning.

The full protocols give you two channels of position control: one channel sets the *most significant* 8 bits (*coarse adjustment*), while the second channel sets the *least significant* 8 bits (*fine adjustment*) of a 16-bit value. The high order bit gives you 256 times the number of litho position stops (65,536 for 16-bit compared to 256 for 8-bit).

Macros

Technobeam full protocol, Technoray full protocol and Technpro protocol offer 28 selectable macros to simplify programming. A *macro* is a set of preconfigured constructs you can use with any other combination of constructs you want, except Laser Aiming Device constructs. Because the Technobeam Laser Aiming Device shares the same DMX channel, you cannot use both macros and the Laser Aiming Device at the same time.

MSpeed vs. Fast Changes

There are two different ways you can choose to move the color and litho wheels: fast changes or MSpeed changes.

A *fast* change means the color or litho movement is completed in the shortest amount of time after the wheel starts moving.

An *MSpeed* (motor/mirror speed) change occurs smoothly over the entire MSpeed time value. For example, if you choose a numerical DMX value of 202 for an MSpeed color change from position 2 to position 4, that means the color wheel changes gradually to position 4 over 11.41 seconds. (Most controllers also allow you to program advanced features, like crossfade or delay time. Make sure your MSpeed value is at least as long as the crossfade or delay time; otherwise, the color or litho change will not complete before the next page or scene starts.)

MSpeed time values are shown in Table A-4 on page A-18.

Ramp Open, Snap Shut

The Shutter construct includes parameters named “Ramp open, snap shut” and “Snap open, ramp shut”. A *snap* is an instant shutter movement (opening or closing); the snap time never varies. What you can vary is the timing of the *ramp*, which is a gradual shutter movement. A lower value always means a longer ramp, and a higher value always means a shorter ramp.

Forward and Reverse Spins

A *forward* spin on all wheels and positions means the wheel or position spins clockwise as you’re looking at the projected image. A *reverse* spin means the wheel or position spins counter-clockwise.

Technobeam™ Protocol

Table A-1 gives the DMX channel assignments for the Technobeam full 18-channel protocol and reduced 14-channel protocol. The column "Ch. (F)" lists channel assignments for the full protocol and the column "Ch. (R)" lists channel assignments for the reduced protocol.

Table A-1. Technobeam DMX Assignments

Ch. (F)	Ch. (R)	Construct	Parameter	Value (dec.)	Value (%)	Value (hex)
1	1	Pan (mirror) position	Coarse adjustment	0 - 255	0 - 100	00h - FFh
2	n/a	Pan (mirror) position	Fine adjustment	0 - 255	0 - 100	00h - FFh
3	2	Tilt (mirror) position	Coarse adjustment	0 - 255	0 - 100	00h - FFh
4	n/a	Tilt (mirror) position	Fine adjustment	0 - 255	0 - 100	00h - FFh
5	3	**Color wheel functions** Fast color change (at beginning of wheel movement) Select the function with this channel. Then use ch. 6 (F) or 4 (R) to set the position or spin speed.	Indexed (wheel snaps to center of aperture)	0 - 15	0 - 5	00h - 0Fh
			Forward spin	16 - 31	6 - 12	10h - 1Fh
			Reverse spin	32 - 47	13 - 18	20h - 2Fh
			Continuous	48 - 63	19 - 24	30h - 3Fh
			Slow scan	64 - 79	25 - 30	40h - 4Fh
			Fast scan	80 - 95	31 - 37	50h - 5Fh
			Random	96 - 111	38 - 43	60h - 6Fh
			Blink (same as index, except shutter closes between apertures)	112 - 127	44 - 49	70h - 7Fh
		Color changes set by MSpeed (use ch. 16 (F) or 13 (R) to set MSpeed time). Select the parameter with this channel. Then use ch. 6 (F) or 4 (R) to set the position or spin speed.	Indexed (wheel snaps to center of aperture)	128 - 143	50 - 56	80h - 8Fh
			Forward spin	144 - 159	57 - 62	90h - 9Fh
			Reverse spin	160 - 175	63 - 68	A0h - AFh
			Continuous	176 - 191	69 - 74	B0h - BFh
			Slow scan	192 - 207	75 - 81	C0h - CFh
			Fast scan	208 - 223	82 - 87	D0h - DFh
			Random	224 - 239	88 - 93	E0h - EFh
			Blink (same as index, except shutter closes between apertures)	240 - 255	94 - 100	F0h - FFh
6	4	**Color wheel position and functions** Position (aperture) selection for blink or index mode (use with ch. 5 (F) or 3 (R))	Position 1 (open)	0 - 23 248 - 255	0 - 9 97 - 100	00h - 17h F8h - FFh
			Position 2	24 - 31	9 - 12	18h - 1Fh
			Position 3	32 - 39	13 - 15	20h - 27h

Table A-1. Technobeam DMX Assignments

Ch. (F)	Ch. (R)	Construct	Parameter	Value (dec.)	Value (%)	Value (hex)
			Position 4	40 - 47	16 - 18	28h - 2Fh
			Position 5	48 - 55	19 - 22	30h - 37h
			Position 6	56 - 63	22 - 24	38h - 3Fh
			Position 7	64 - 71	25 - 27	40h - 47h
			Position 8	72 - 79	28 - 30	48h - 4Fh
			Position 9	80 - 87	31 - 34	50h - 57h
			Position 10	88 - 95	35 - 37	58h - 5Fh
			Position 11	96 - 103	38 - 40	60h - 67h
			Position 12	104 - 111	41 - 43	68h - 6Fh
			Position 13	112 - 127	44 - 49	70h - 7Fh
			Half color 1 and 2	128 - 143	50 - 56	80h - 8Fh
			Half color 2 and 3	144 - 151	57 - 59	90h - 97h
			Half color 3 and 4	152 - 159	60 - 62	98h - 9Fh
			Half color 4 and 5	160 - 167	63 - 65	A0h - A7h
			Half color 5 and 6	168 - 175	66 - 68	A8h - AFh
			Half color 6 and 7	176 - 183	69 - 71	B0h - B7h
			Half color 7 and 8	184 - 191	72 - 74	B8h - BFh
			Half color 8 and 9	192 - 199	75 - 78	C0h - C7h
			Half color 9 and 10	200 - 207	79 - 81	C8h - CFh
			Half color 10 and 11	208 - 215	82 - 84	D0h - D7h
			Half color 11 and 12	216 - 223	85 - 87	D8h - DFh
			Half color 12 and 13	224 - 231	88 - 90	E0h - E7h
			Half color 13 and 1	232 - 247	91 - 96	E8h - F7h
		Color wheel continuous forward/reverse spin (use with ch. 5 (F) or 3 (R))	No spin	0 - 3	0 - 1	00h - 03h
			Slowest spin to fastest spin	4 - 255	2 - 100	04h - FFh
		Color wheel continuous variation (wheel position is 360 * (channel dec. value / 255) Use with ch. 5 (F) or 3 (R)	Centered on position 1 (open)	0 255	0 100	00h FFh
			Centered on position 2	19	7	13h
			Centered on position 3	39	15	27h
			Centered on position 4	58	23	3Ah
			Centered on position 5	78	31	4Eh
			Centered on position 6	98	38	62h
			Centered on position 7	117	46	75h
			Centered on position 8	137	54	89h
			Centered on position 9	156	61	9Ch

Table A-1. Technobeam DMX Assignments

Ch. (F)	Ch. (R)	Construct	Parameter	Value (dec.)	Value (%)	Value (hex)
			Centered on position 10	176	69	B0h
			Centered on position 11	196	77	C4h
			Centered on position 12	215	84	D7h
			Centered on position 13	235	92	EBh
7	5	**Litho wheel functions** Fast litho changes (at beginning of wheel movement) Select the function with this channel. Then use chs. 8, 9 & 10 (F) or chs. 6 & 7 (R) to set other options. Random and scan pause time set by chs. 9 & 10 (F) or ch. 7 (R)	Indexed (wheel snaps to center of aperture)	0 - 15	0 - 5	00h - 0Fh
			Forward spin	16 - 31	6 - 12	10h - 1Fh
			Reverse spin	32 - 47	13 - 18	20h - 2Fh
			Scan	48 - 63	19 - 24	30h - 3Fh
			Blink (same as index, except shutter closes between apertures)	64 - 79	25 - 30	40h - 4Fh
			Random	80 - 95	31 - 37	50h - 5Fh
			Reserved	96 - 111	38 - 43	60h - 6Fh
			Wheel spin	112 - 127	44 - 49	70h - 7Fh
		Litho changes set by MSpeed (use ch. 16 (F) or 13 (R) to set MSpeed time) Select the parameter with this channel. Then use chs. 8, 9 & 10 (F) or chs. 6 & 7 (R) to set other options. Random and scan pause time set by ch. 9 (F) or ch. 7 (R)	Indexed (wheel snaps to center of aperture)	128 - 143	50 - 56	80h - 8Fh
			Forward spin	144 - 159	57 - 62	90h - 9Fh
			Reverse spin	160 - 175	63 - 68	A0h - AFh
			Scan	176 - 191	69 - 74	B0h - BFh
			Blink (same as index, except shutter closes between apertures)	192 - 207	75 - 81	C0h - CFh
			Random	208 - 223	82 - 87	D0h - DFh
			Reserved	224 - 239	88 - 93	E0h - EFh
			Wheel spin	240 - 255	94 - 100	F0h - FFh
8	6	**Litho wheel position** Position (aperture) selection for blink or index mode (use with ch. 5 (F) or 3 (R))	Position 1 (open)	0 - 15 240 - 255	0 - 5 94 - 100	00h - 0Fh F0h - FFh
			Position 2	16 - 47	6 - 18	10h - 2Fh
			Position 3	48 - 79	19 - 30	30h - 4Fh
			Position 4	80 - 111	31 - 43	50h - 6Fh
			Position 5	112 - 143	44 - 56	70h - 8Fh
			Position 6	144 - 175	57 - 68	90h - AFh
			Position 7	176 - 207	69 - 81	B0h - CFh
			Position 8	208 - 239	82 - 93	D0h - EFh
9	7	**Litho rotation (coarse adjustment) and functions**	Angular position for blink and index modes	0 - 255	0 - 100	00h - FFh

Table A-1. Technobeam DMX Assignments

Ch. (F)	Ch. (R)	Construct	Parameter	Value (dec.)	Value (%)	Value (hex)
		Random	Random pause time, shortest to longest	0 - 255	0 - 100	00h - FFh
		Scan	Scan rate, slowest to fastest	0 - 255	0 - 100	00h - FFh
		Litho wheel spin (use with ch. 7 (F) or ch. 5 (R) Entire wheel spins, not individual lithos	Forward spin, fastest to slowest	0 - 119	0 - 47	0 - 77h
			No spin	120 - 135	47 - 53	78h - 87h
			Reverse spin, slowest to fastest	136 - 255	53 - 100	88h - FFh
10	n/a	**Litho rotation (fine adjustment)**	Angular position for blink and index modes	0 - 255	0 - 100	00h - FFh
11	8	**Effects position** Fast effects changes (at beginning of wheel movement) Select the position with this channel. Then use ch. 12 (F) or ch. 9 (R) to set spin direction and speed.	Position 1	0 - 25	0 - 9	00h - 19h
			Position 2	26 - 51	10 - 20	1Ah - 33h
			Position 3	52 - 76	21 - 29	34h - 4Ch
			Position 4	77 - 102	31 - 40	4Dh - 66h
			Position 5	103 - 127	41 - 49	67h - 7Fh
		Effects changes set by MSpeed (use ch. 16 (F) or 13 (R) to set MSpeed time) Select the position with this channel. Then use ch. 12 (F) or ch. 9 (R) to set spin direction and speed	Position 1	128 - 153	50 - 60	80h - 99h
			Position 2	154 - 178	61 - 69	9Ah - B2h
			Position 3	179 - 204	70 - 80	B2h - CCh
			Position 4	205 - 229	81 - 89	CDh - E5h
			Position 5	230 - 255	90 - 100	E6h - FFh
12	9	**Effects spin speed** (use with ch. 11 (F) or ch. 8 (R))	Forward spin fast to slow forward spin	0 - 120	0 - 47	00h - 78h
			No spin	121 - 134	48 - 52	79h - 86h
			Reverse spin slow to fast forward spin	135 - 255	53 - 100	87h - FFh
13	10	**Focus**	Variable focus	0 - 255	0 - 100	00h - FFh
14	11	**Shutter** Longest ramp time = lowest value (snap time is always short)	Closed	0 - 7	0 - 2	00h - 07h
			Periodic strobe	8 - 67	3 - 26	08h - 43h
			Random strobe	68 - 127	27 - 49	44h - 7Fh
			Ramp open, snap shut	128 - 187	50 - 73	80h - BBh
			Snap open, ramp shut	188 - 247	74 - 96	BCh - F7h
			Open	248 - 255	97 - 100	F8h - FFh
15	12	**Dim**	Full dark to full bright	0 - 255	0 - 100	00h - FFh
16	13	**MSpeed**	Movement time (see Table A-4 on page A-18)			

Table A-1. Technobeam DMX Assignments

Ch. (F)	Ch. (R)	Construct	Parameter	Value (dec.)	Value (%)	Value (hex)
17	n/a	**Laser Aiming Device (LAD)**	LAD off	0 - 7 120 - 127	0 - 3 47 - 49	00 - 07h 78h - 7Fh
			LAD modulate slow to fast[1]	128 - 247	50 - 96	80h - F7h
			LAD on (continuous)	248 - 255	97 - 100	F8h - FFh
		Macros	Macro 1—28 (see Table A-5 on page A-22)			
18	14	**Control[2]**	Safe[3]	0 - 7	0 - 3	00h - 07h
			Display off	24 - 26	9 - 10	18h - 1Ah
			Display dim	32 - 34	13	20h - 22h
			Display bright	40 - 42	16	28h - 2Ah
			Home[4]	64 - 66	25 - 26	40h - 42h
			Lamp on[5]	80 - 82	31 - 32	50h - 52h
			Lamp off[6]	96 - 98	38	60h - 62h
			Shutdown	128 - 130	50 - 51	80h - 82h

[1] - “Slow” modulation is 4.25 times/sec and “fast” modulation is 255 times/sec, at 50% duty cycle.

[2] - You must set the Shutter channel to zero before accessing the Control channel.

[3] - When set to Safe, the control channel has no effect if the shutter is closed.

[4] - Hold the Control channel at this value for at least one second. Homing the fixture in this way does not change the state of the lamp (if the lamp was off, it stays off; if the lamp was on, it stays on).

[5] - Hold the Control channel at this value for at least one second. If the lamp is currently off, turning the lamp on in this way causes the fixture to home. (If the lamp was already on, the command has no effect.)

[6] - Hold the Control channel at this value for at least one second. The lamp will also turn on whenever you power up the fixture on a link when there is a controller present and it is sending data commands.

Technoray™ Protocol

Table A-2 gives the DMX channel assignments for the Technoray full 14-channel protocol and reduced 12-channel protocol. The column "Ch. (F)" lists channel assignments for the full protocol and the column "Ch. (R)" lists channel assignments for the reduced protocol.

Table A-2. Technoray DMX Assignments

Ch. (F)	Ch. (R)	Construct	Parameter	Value (dec.)	Value (%)	Value (hex)
1	1	**Color wheel functions** Fast color change (at beginning of wheel movement) Select the parameter with this channel. Then use ch. 2 to set the position or spin speed.	Indexed (wheel snaps to center of aperture)	0 - 15	0 - 5	00h - 0Fh
			Forward spin	16 - 31	6 - 12	10h - 1Fh
			Reverse spin	32 - 47	13 - 18	20h - 2Fh
			Continuous	48 - 63	19 - 24	30h - 3Fh
			Slow scan	64 - 79	25 - 30	40h - 4Fh
			Fast scan	80 - 95	31 - 37	50h - 5Fh
			Random	96 - 111	38 - 43	60h - 6Fh
			Blink (same as index, except shutter closes between apertures)	112 - 127	44 - 49	70h - 7Fh
		Color changes set by MSpeed (use ch. 12 (F) or 11 (R) to set MSpeed time) Select the function with this channel. Then use ch. 2 to set the position or spin speed.	Indexed (wheel snaps to center of aperture)	128 - 143	50 - 56	80h - 8Fh
			Forward spin	144 - 159	57 - 62	90h - 9Fh
			Reverse spin	160 - 175	63 - 68	A0h - AFh
			Continuous	176 - 191	69 - 74	B0h - BFh
			Slow scan	192 - 207	75 - 81	C0h - CFh
			Fast scan	208 - 223	82 - 87	D0h - DFh
			Random	224 - 239	88 - 93	E0h - EFh
			Blink (same as index, except shutter closes between apertures)	240 - 255	94 - 100	F0h - FFh
2	2	**Color wheel position and functions** Position (aperture) selection for blink or index mode (use with ch. 1)	Position 1 (open)	0 - 23 248 - 255	0 - 9 97 - 100	00h - 17h F8h - FFh
			Position 2	24 - 31	9 - 12	18h - 1Fh
			Position 3	32 - 39	13 - 15	20h - 27h
			Position 4	40 - 47	16 - 18	28h - 2Fh
			Position 5	48 - 55	19 - 22	30h - 37h
			Position 6	56 - 63	22 - 24	38h - 3Fh
			Position 7	64 - 71	25 - 27	40h - 47h
			Position 8	72 - 79	28 - 30	48h - 4Fh

Table A-2. Technoray DMX Assignments

Ch. (F)	Ch. (R)	Construct	Parameter	Value (dec.)	Value (%)	Value (hex)
			Position 9	80 - 87	31 - 34	50h - 57h
			Position 10	88 - 95	35 - 37	58h - 5Fh
			Position 11	96 - 103	38 - 40	60h - 67h
			Position 12	104 - 111	41 - 43	68h - 6Fh
			Position 13	112 - 127	44 - 49	70h - 7Fh
			Half color 1 and 2	128 - 143	50 - 56	80h - 8Fh
			Half color 2 and 3	144 - 151	57 - 59	90h - 97h
			Half color 3 and 4	152 - 159	60 - 62	98h - 9Fh
			Half color 4 and 5	160 - 167	63 - 65	A0h - A7h
			Half color 5 and 6	168 - 175	66 - 68	A8h - AFh
			Half color 6 and 7	176 - 183	69 - 71	B0h - B7h
			Half color 7 and 8	184 - 191	72 - 74	B8h - BFh
			Half color 8 and 9	192 - 199	75 - 78	C0h - C7h
			Half color 9 and 10	200 - 207	79 - 81	C8h - CFh
			Half color 10 and 11	208 - 215	82 - 84	D0h - D7h
			Half color 11 and 12	216 - 223	85 - 87	D8h - DFh
			Half color 12 and 13	224 - 231	88 - 90	E0h - E7h
			Half color 13 and 1	232 - 247	91 - 96	E8h - F7h
		Color wheel forward/ reverse spin (use with ch. 1)	No spin	0 - 3	0 - 1	00h - 03h
			Slowest spin to fastest spin	4 - 255	2 - 100	04h - FFh
		Color wheel continuous variation (wheel position is 360 * channel dec. value / 255) (use with ch. 1)	Centered on position 1 (open)	0 255	0 100	00h FFh
			Centered on position 2	19	7	13h
			Centered on position 3	39	15	27h
			Centered on position 4	58	23	3Ah
			Centered on position 5	78	31	4Eh
			Centered on position 6	98	38	62h
			Centered on position 7	117	46	75h
			Centered on position 8	137	54	89h
			Centered on position 9	156	61	9Ch
			Centered on position 10	176	69	B0h
			Centered on position 11	196	77	C4h
			Centered on position 12	215	84	D7h
			Centered on position 13	235	92	EBh

Table A-2. Technoray DMX Assignments

Ch. (F)	Ch. (R)	Construct	Parameter	Value (dec.)	Value (%)	Value (hex)
3	3	**Litho wheel functions** Fast litho changes (at beginning of wheel movement) Select the function with this channel. Then use chs. 4, 5 & 6 (F) or chs.4 & 5 (R) set other options. Random and scan pause time set by chs. 5 & 6 (F) or ch. 5 (R)	Indexed (wheel snaps to center of aperture)	0 - 15	0 - 5	00h - 0Fh
			Forward spin	16 - 31	6 - 12	10h - 1Fh
			Reverse spin	32 - 47	13 - 18	20h - 2Fh
			Scan	48 - 63	19 - 24	30h - 3Fh
			Blink (same as index, except shutter closes between apertures)	64 - 79	25 - 30	40h - 4Fh
			Random	80 - 95	31 - 37	50h - 5Fh
			Reserved	96 - 111	38 - 43	60h - 6Fh
			Wheel spin	112 - 127	44 - 49	70h - 7Fh
		Litho changes set by MSpeed (use ch. 12 (F) or 11 (R) to set MSpeed time) Select the parameter with this channel. Then use chs. 4, 5 & 6 (F) or chs.4 & 5 (R) set other options. Random and scan pause time set by ch. 5	Indexed (wheel snaps to center of aperture)	128 - 143	50 - 56	80h - 8Fh
			Forward spin	144 - 159	57 - 62	90h - 9Fh
			Reverse spin	160 - 175	63 - 68	A0h - AFh
			Scan	176 - 191	69 - 74	B0h - BFh
			Blink (same as index, except shutter closes between apertures)	192 - 207	75 - 81	C0h - CFh
			Random	208 - 223	82 - 87	D0h - DFh
			Reserved	224 - 239	88 - 93	E0h - EFh
			Wheel spin	240 - 255	94 - 100	F0h - FFh
4	4	**Litho wheel position** Position (aperture) selection for blink or index mode (use with ch. 3)	Position 1 (open)	0 - 15 240 - 255	0 - 5 94 - 100	00h - 0Fh F0h - FFh
			Position 2	16 - 47	6 - 18	10h - 2Fh
			Position 3	48 - 79	19 - 30	30h - 4Fh
			Position 4	80 - 111	31 - 43	50h - 6Fh
			Position 5	112 - 143	44 - 56	70h - 8Fh
			Position 6	144 - 175	57 - 68	90h - AFh
			Position 7	176 - 207	69 - 81	B0h - CFh
			Position 8	208 - 239	82 - 93	D0h - EFh
5	5	**Litho rotation (coarse adjustment) and functions**	Angular position for blink and index modes	0 - 255	0 - 100	00h - FFh
		Random	Random pause time, shortest to longest	0 - 255	0 - 100	00h - FFh
		Scan	Scan rate, slowest to fastest	0 - 255	0 - 100	00h - FFh

Table A-2. Technoray DMX Assignments

Ch. (F)	Ch. (R)	Construct	Parameter	Value (dec.)	Value (%)	Value (hex)
		Wheel spin Entire wheel spins, not individual lithos	Forward spin, fastest to slowest	0 - 119	0 - 47	0 - 77h
			No spin	120 - 135	47 - 53	78h - 87h
			Reverse spin, slowest to fastest	136 - 255	53 - 100	88h - FFh
6	n/a	**Litho rotation (fine adjustment)**	Angular position for blink and index modes	0 - 255	0 - 100	00h - FFh
7	6	**Effects position** Fast effects change (at beginning of wheel movement) Select the position with this channel. Then use ch. 8 (F) or ch. 7 (R) to set spin direction and speed.	Position 1	0 - 25	0 - 9	00h - 19h
			Position 2	26 - 51	10 - 20	1Ah - 33h
			Position 3	52 - 76	21 - 29	34h - 4Ch
			Position 4	77 - 102	31 - 40	4Dh - 66h
			Position 5	103 - 127	41 - 49	67h - 7Fh
		Effects changes set by MSpeed (use ch. 12 (F) or 11 (R) to set MSpeed time) Select the position with this channel. Then use ch. 8 (F) or ch. 7 (R) to set spin direction and speed.	Position 1	128 - 153	50 - 60	80h - 99h
			Position 2	154 - 178	61 - 69	9Ah - B2h
			Position 3	179 - 204	70 - 80	B2h - CCh
			Position 4	205 - 229	81 - 89	CDh - E5h
			Position 5	230 - 255	90 - 100	E6h - FFh
8	7	**Effects spin speed** (use with ch. 7 (F) or 6 (R))	Forward spin fast to slow forward spin	0 - 120	0 - 47	00h - 78h
			No spin	121 - 134	48 - 52	79h - 86h
			Reverse spin slow to fast forward spin	135 - 255	53 - 100	87h - FFh
9	8	**Focus**	Variable focus	0 - 255	0 - 100	00h - FFh
10	9	**Shutter** Longest ramp time = lowest value (snap time is always short)	Closed	0 - 7	0 - 2	00h - 07h
			Periodic strobe	8 - 67	3 - 26	08h - 43h
			Random strobe	68 - 127	27 - 49	44h - 7Fh
			Ramp open, snap shut	128 - 187	50 - 73	80h - BBh
			Snap open, ramp shut	188 - 247	74 - 96	BCh - F7h
			Open	248 - 255	97 - 100	F8h - FFh
11	10	**Dim**	Full dark to full bright	0 - 255	0 - 100	00h - FFh
12	11	**MSpeed**	Movement time (see Table A-4 on page A-18)			
13	n/a	**Macros**	Macro 1—28 (see Table A-5 on page A-22)			

Table A-2. Technoray DMX Assignments

Ch. (F)	Ch. (R)	Construct	Parameter	Value (dec.)	Value (%)	Value (hex)
14	12	**Control**[1]	Safe[2]	0 - 7	0 - 3	00h - 07h
			Display off	24 - 26	9 - 10	18h - 1Ah
			Display dim	32 - 34	13	20h - 22h
			Display bright	40 - 42	16	28h - 2Ah
			Home[3]	64 - 66	25 - 26	40h - 42h
			Lamp on[4]	80 - 82	31 - 32	50h - 52h
			Lamp off[5]	96 - 98	38	60h - 62h
			Shutdown	128 - 130	50 - 51	80h - 82h

[1] - You must set the Shutter channel to zero before accessing the Control channel.

[2] - When set to Safe, the control channel has no effect if the shutter is closed.

[3] - Hold the Control channel at this value for at least one second. Homing the fixture in this way does not change the state of the lamp (if the lamp was off, it stays off; if the lamp was on, it stays on).

[4] - Hold the Control channel at this value for at least one second. If the lamp is currently off, turning the lamp on in this way causes the fixture to home. (If the lamp was already on, the command has no effect.)

[5] - Hold the Control channel at this value for at least one second. The lamp will also turn ON whenever you power up the fixture if a controller is sending data commands on the link.

Technopro™ Protocol

Table A-3 gives the DMX channel assignments for the Technopro 12-channel protocol.

Table A-3. Technopro DMX Assignments

Ch.	Construct	Parameter	Value (dec.)	Value (%)	Value (hex)
1	**Color wheel 1 functions** Fast color change (at beginning of wheel movement) Select the function with this channel. Then use ch. 2 to set the position or spin speed.	Indexed	0 - 15	0 - 6	00h - 0Fh
		Forward spin	16 - 31	6 - 12	10h - 1Fh
		Reverse spin	32 - 47	13 - 18	20h - 2Fh
		Continuous	48 - 63	19 - 25	30h - 3Fh
		Slow scan	64 - 79	25 - 31	40h - 4Fh
		Fast scan	80 - 95	31 - 37	50h - 5Fh
		Random	96 - 111	38 - 44	60h - 6Fh
		Blink	112 - 127	44 - 50	70h - 7Fh
	Color changes set by MSpeed (use ch. 10 to set MSpeed time) Select the parameter with this channel. Then use ch. 2 to set the position or spin speed.	Indexed	128 - 143	50 - 56	80h - 8Fh
		Forward spin	144 - 159	56 - 62	90h - 9Fh
		Reverse spin	160 - 175	63 - 69	A0h - AFh
		Continuous	176 - 191	69 - 75	B0h - BFh
		Slow scan	192 - 207	75 - 81	C0h - CFh
		Fast scan	208 - 223	82 - 87	D0h - DFh
		Random	224 - 239	88 - 94	E0h - EFh
		Blink	240 - 255	94 - 100	F0h - FFh
2	**Color wheel 1 position and functions** Position (aperture) selection for blink or index mode (use with ch. 1)	Position 1 (open)	0 - 23 248 - 255	0 - 9 97 - 100	00h - 17h F8h - FFh
		Position 2	24 - 31	9 - 12	18h - 1Fh
		Position 3	32 - 39	13 - 15	20h - 27h
		Position 4	40 - 47	16 - 18	28h - 2Fh
		Position 5	48 - 55	19 - 22	30h - 37h
		Position 6	56 - 63	22 - 25	38h - 3Fh
		Position 7	64 - 71	25 - 28	40h - 47h
		Position 8	72 - 79	28 - 31	48h - 4Fh
		Position 9	80 - 87	31 - 34	50h - 57h
		Position 10	88 - 95	35 - 37	58h - 5Fh
		Position 11	96 - 103	38 - 40	60h - 67h
		Position 12	104 - 111	41 - 44	68h - 6Fh
		Position 13	112 - 127	44 - 50	70h - 7Fh
		Half color 1 and 2	128 - 143	50 - 56	80h - 8Fh

Table A-3. Technopro DMX Assignments

Ch.	Construct	Parameter	Value (dec.)	Value (%)	Value (hex)
		Half color 2 and 3	144 - 151	56 - 59	90h - 97h
		Half color 3 and 4	152 - 159	60 - 62	98h - 9Fh
		Half color 4 and 5	160 - 167	63 - 65	A0h - A7h
		Half color 5 and 6	168 - 175	66 - 69	A8h - AFh
		Half color 6 and 7	176 - 183	69 - 72	B0h - B7h
		Half color 7 and 8	184 - 191	72 - 75	B8h - BFh
		Half color 8 and 9	192 - 199	75 - 78	C0h - C7h
		Half color 9 and 10	200 - 207	78 - 81	C8h - CFh
		Half color 10 and 11	208 - 215	82 - 84	D0h - D7h
		Half color 11 and 12	216 - 223	85 - 87	D8h - DFh
		Half color 12 and 13	224 - 231	88 - 91	E0h - E7h
		Half color 13 and 1	232 - 247	91 - 97	E8h - F7h
	Color wheel continuous forward/ reverse spin (use with ch.1)	No spin	0 - 3	0 - 1	00h - 03h
		Slowest spin to fastest spin	4 - 255	2 - 100	04h - FFh
	Color wheel continuous variation (wheel position is 360 * channel dec. value / 255) Use with ch.1	Centered on position 1 (open)	0 255	0 100	00h FFh
		Centered on position 2	19	7	13h
		Centered on position 3	39	15	27h
		Centered on position 4	58	23	3Ah
		Centered on position 5	78	31	4Eh
		Centered on position 6	98	38	62h
		Centered on position 7	117	46	75h
		Centered on position 8	137	54	89h
		Centered on position 9	156	61	9Ch
		Centered on position 10	176	69	B0h
		Centered on position 11	196	77	C4h
		Centered on position 12	215	84	D7h
		Centered on position 13	235	92	EBh
3	**Color wheel 2 functions**	same as ch. 1	see ch. 1	see ch. 1	see ch. 1
4	**Color wheel 2 position and functions** Aperture selection for blink or index mode (use with ch. 1)	Position 1 (open)	0 - 15 240 - 255	0 - 6 94 - 100	00h - 0Fh F0h - FFh
		Position 2	16 - 47	6 - 18	10h - 2Fh
		Position 3	48 - 79	19 - 31	30h - 4Fh
		Position 4	80 - 111	31 - 44	50h - 6Fh
		Position 5	112 - 143	44 - 56	70h - 8Fh
		Position 6	144 - 175	56 - 69	90h - AFh

Table A-3. Technopro DMX Assignments

Ch.	Construct	Parameter	Value (dec.)	Value (%)	Value (hex)
		Position 7	176 - 207	69 - 81	B0h - CFh
		Position 8	208 - 239	82 - 94	D0h - EFh
	Color wheel 2 wheel forward/ reverse spin (use with ch. 3)	No spin	0 - 3	0 - 1	00h - 03h
		Fast forward/reverse spin to slow forward/reverse spin	4 - 255	2 - 100	04h - FFh
	Color wheel 2 continuous (use with ch. 3) Wheel position = 360 * (ch. dec. value/255)	Centered on position 1 (open)	0 255	0 100	00h FFh
		Centered on position 2	32	13	20h
		Centered on position 3	64	25	40h
		Centered on position 4	96	38	60h
		Centered on position 5	128	50	80h
		Centered on position 6	159	62	9Fh
		Centered on position 7	191	75	BFh
		Centered on position 8	223	87	DFh
5	**Effects position** Fast effects change (at beginning of wheel movement) Select the position with this channel. Then use ch. 6 to set spin direction and speed.	Position 1	0 - 25	0 - 10	00h - 19h
		Position 2	26 - 51	10 - 20	1Ah - 33h
		Position 3	52 - 76	20 - 30	34h - 4Ch
		Position 4	77 - 102	30 - 40	4Dh - 66h
		Position 5	103 - 127	40 - 50	67h - 7Fh
	Effects changes set by MSpeed (use ch. 10 to set MSpeed time) Select the position with this channel. Then use ch. 6 to set spin direction and speed	Position 1	128 - 153	50 - 60	80h - 99h
		Position 2	154 - 178	60 - 70	9Ah - B2h
		Position 3	179 - 204	70 - 80	B3h - CCh
		Position 4	205 - 229	81 - 89	CDh - E5h
		Position 5	230 - 255	90 - 100	E6h - FFh
6	**Effects spin speed** (use with ch. 5)	Forward spin fast to slow forward spin	0 - 120	0 - 47	00h - 78h
		No spin	121 - 134	47 - 53	79h - 86h
		Reverse spin slow to fast reverse spin	135 - 255	53 - 100	87h - FFh
7	**Focus**	Variable focus	0 - 255	0 - 100	00h - FFh
8	**Shutter** Longest ramp time = lowest value (snap time is always short)	Closed	0 - 7	0 - 3	00h - 07h
		Periodic strobe	8 - 67	3 - 26	08h - 43h
		Random strobe	68 - 127	27 - 50	44h - 7Fh
		Ramp open, snap shut	128 - 187	50 - 73	80h - BBh
		Snap open, ramp shut	188 - 247	74 - 97	BCh - F7h
		Open	248 - 255	97 - 100	F8h - FFh
9	**Dim**	Full dark to full bright	0 - 255	0 - 100	00h - FFh

Table A-3. Technopro DMX Assignments

Ch.	Construct	Parameter	Value (dec.)	Value (%)	Value (hex)
10	**MSpeed**	Movement time (see Table A-4 on page A-18)			
11	**Macros**	Macro 1—28 (see Table A-5 on page A-22)			
12	**Control**[1]	Safe[2]	0 - 7	0 - 3	00h - 07h
		Display off	24 - 26	9 - 10	18h - 1Ah
		Display dim	32 - 34	13	20h - 22h
		Display bright	40 - 42	16	28h - 2Ah
		Home[3]	64 - 66	25 - 26	40h - 42h
		Lamp on[4]	80 - 82	31 - 32	50h - 52h
		Lamp off[5]	96 - 98	38	60h - 62h
		Shutdown	128 - 130	50 - 51	80h - 82h

[1] - You must set the Shutter channel to zero before accessing the Control channel.

[2] - When set to Safe, the control channel has no effect if the shutter is closed.

[3] - Hold the Control channel at this value for at least one second. Homing the fixture in this way does not change the state of the lamp (if the lamp was off, it stays off; if the lamp was on, it stays on).

[4] - Hold the Control channel at this value for at least one second. If the lamp is currently off, turning the lamp on in this way causes the fixture to home. (If the lamp was already on, the command has no effect.)

[5] - Hold the Control channel at this value for at least one second. The lamp will also turn ON whenever you power up the fixture if a controller is sending data commands on the link.

MSpeed Movement Times

Use Table A-4 to determine the MSpeed (motor/mirror) movement times for Technobeam, Technopro or Technoray in seconds.

An MSpeed (motor/mirror speed) change occurs smoothly over the entire MSpeed time value. For example, if you choose a numerical DMX value of 202 for an MSpeed color change from position 2 to position 4, that means the color wheel changes gradually to position 4 over 11.41 seconds.

Note The values displayed in the "Value (%)" , "Value (hex)" and "Value (num)" columns may vary slightly depending on your controller's rounding conventions.

Table A-4. MSpeed Movement Times

Time (sec.)	Value (dec.)	Value (%)	Value (hex)	Time (sec.)	Value (dec.)	Value (%)	Value (hex)
0.15	255	100	FFh	2.27	232	91	E8h
0.15	254	100	FEh	2.46	231	91	E7h
0.17	253	99	FDh	2.66	230	90	E6h
0.19	252	99	FCh	2.86	229	90	E5h
0.21	251	98	FBh	3.07	228	89	E4h
0.25	250	98	FAh	3.29	227	89	E3h
0.29	249	98	F9h	3.52	226	89	E2h
0.35	248	97	F8h	3.76	225	88	E1h
0.41	247	97	F7h	4.00	224	88	E0h
0.47	246	96	F6h	4.25	223	87	DFh
0.55	245	96	F5h	4.52	222	87	DEh
0.63	244	96	F4h	4.78	221	87	DDh
0.73	243	95	F3h	5.06	220	86	DCh
0.83	242	95	F2h	5.34	219	86	DBh
0.94	241	95	F1h	5.64	218	85	DAh
1.05	240	94	F0h	5.94	217	85	D9h
1.18	239	94	EFh	6.25	216	85	D8h
1.31	238	93	EEh	6.56	215	84	D7h
1.45	237	93	EDh	6.89	214	84	D6h
1.60	236	93	ECh	7.22	213	84	D5h
1.75	235	92	EBh	7.56	212	83	D4h
1.92	234	92	EAh	7.91	211	83	D3h
2.09	233	91	E9h	8.27	210	82	D2h

Table A-4. MSpeed Movement Times

Time (sec.)	Value (dec.)	Value (%)	Value (hex)	Time (sec.)	Value (dec.)	Value (%)	Value (hex)
8.63	209	82	D1h	26.45	174	68	AEh
9.00	208	82	D0h	27.10	173	68	ADh
9.39	207	81	CFh	27.76	172	67	ACh
9.77	206	81	CEh	28.43	171	67	ABh
10.17	205	80	CDh	29.11	170	67	AAh
10.58	204	80	CCh	29.80	169	66	A9h
10.99	203	80	CBh	30.49	168	66	A8h
11.41	202	79	CAh	31.19	167	65	A7h
11.84	201	79	C9h	31.90	166	65	A6h
12.28	200	78	C8h	32.62	165	65	A5h
12.72	199	78	C7h	33.34	164	64	A4h
13.17	198	78	C6h	34.08	163	64	A3h
13.63	197	77	C5h	34.82	162	64	A2h
14.10	196	77	C4h	35.57	161	63	A1h
14.58	195	76	C3h	36.33	160	63	A0h
15.07	194	76	C2h	37.09	159	62	9Fh
15.56	193	76	C1h	37.87	158	62	9Eh
16.06	192	75	C0h	38.65	157	62	9Dh
16.57	191	75	BFh	39.44	156	61	9Ch
17.09	190	75	BEh	40.23	155	61	9Bh
17.61	189	74	BDh	41.04	154	60	9Ah
18.14	188	74	BCh	41.85	153	60	99h
18.68	187	73	BBh	42.68	152	60	98h
19.23	186	73	BAh	43.50	151	59	97h
19.79	185	73	B9h	44.34	150	59	96h
20.36	184	72	B8h	45.19	149	58	95h
20.93	183	72	B7h	46.04	148	58	94h
21.51	182	71	B6h	46.90	147	58	93h
22.10	181	71	B5h	47.77	146	57	92h
22.70	180	71	B4h	48.65	145	57	91h
23.30	179	70	B3h	49.54	144	56	90h
23.92	178	70	B2h	50.43	143	56	8Fh
24.54	177	69	B1h	51.33	142	56	8Eh
25.17	176	69	B0h	52.24	141	55	8Dh
25.80	175	69	AFh	53.16	140	55	8Ch

Table A-4. MSpeed Movement Times

Time (sec.)	Value (dec.)	Value (%)	Value (hex)	Time (sec.)	Value (dec.)	Value (%)	Value (hex)
54.09	139	55	8Bh	91.55	104	41	68h
55.02	138	54	8Ah	92.76	103	40	67h
55.96	137	54	89h	93.98	102	40	66h
56.91	136	53	88h	95.21	101	40	65h
57.87	135	53	87h	96.45	100	39	64h
58.84	134	53	86h	97.70	99	39	63h
59.81	133	52	85h	98.95	98	38	62h
60.79	132	52	84h	100.22	97	38	61h
61.78	131	51	83h	101.49	96	38	60h
62.78	130	51	82h	102.77	95	37	5Fh
63.79	129	51	81h	104.05	94	37	5Eh
64.80	128	50	80h	105.35	93	36	5Dh
65.82	127	50	7Fh	106.65	92	36	5Ch
66.85	126	49	7Eh	107.96	91	36	5Bh
67.89	125	49	7Dh	109.28	90	35	5Ah
68.94	124	49	7Ch	110.61	89	35	59h
69.99	123	48	7Bh	111.94	88	35	58h
71.05	122	48	7Ah	113.28	87	34	57h
72.13	121	47	79h	114.63	86	34	56h
73.20	120	47	78h	115.99	85	33	55h
74.29	119	47	77h	117.36	84	33	54h
75.38	118	46	76h	118.73	83	33	53h
76.49	117	46	75h	120.12	82	32	52h
77.60	116	45	74h	121.51	81	32	51h
78.71	115	45	73h	122.91	80	31	50h
79.84	114	45	72h	124.31	79	31	4Fh
80.98	113	44	71h	125.73	78	31	4Eh
82.12	112	44	70h	127.15	77	30	4Dh
83.27	111	44	6Fh	128.58	76	30	4Ch
84.43	110	43	6Eh	130.02	75	29	4Bh
85.59	109	43	6Dh	131.47	74	29	4Ah
86.77	108	42	6Ch	132.92	73	29	49h
87.95	107	42	6Bh	134.39	72	28	48h
89.14	106	42	6Ah	135.86	71	28	47h
90.34	105	41	69h	137.34	70	27	46h

Table A-4. MSpeed Movement Times

Time (sec.)	Value (dec.)	Value (%)	Value (hex)	Time (sec.)	Value (dec.)	Value (%)	Value (hex)
138.82	69	27	45h	195.92	34	13	22h
140.32	68	27	44h	197.70	33	13	21h
141.82	67	26	43h	199.48	32	13	20h
143.33	66	26	42h	201.28	31	12	1Fh
144.85	65	25	41h	203.08	30	12	1Eh
146.38	64	25	40h	204.88	29	11	1Dh
147.92	63	25	3Fh	206.70	28	11	1Ch
149.46	62	24	3Eh	208.52	27	11	1Bh
151.01	61	24	3Dh	210.36	26	10	1Ah
152.57	60	24	3Ch	212.19	25	10	19h
154.14	59	23	3Bh	214.04	24	9	18h
155.71	58	23	3Ah	215.90	23	9	17h
157.30	57	22	39h	217.76	22	9	16h
158.89	56	22	38h	219.63	21	8	15h
160.49	55	22	37h	221.51	20	8	14h
162.09	54	21	36h	223.40	19	7	13h
163.71	53	21	35h	225.30	18	7	12h
165.33	52	20	34h	227.20	17	7	11h
166.96	51	20	33h	229.11	16	6	10h
168.60	50	20	32h	231.03	15	6	0Fh
170.25	49	19	31h	232.96	14	5	0Eh
171.91	48	19	30h	234.90	13	5	0Dh
173.57	47	18	2Fh	236.84	12	5	0Ch
175.24	46	18	2Eh	238.79	11	4	0Bh
176.92	45	18	2Dh	240.75	10	4	0Ah
178.61	44	17	2Ch	242.72	9	4	09h
180.30	43	17	2Bh	244.70	8	3	08h
182.01	42	16	2Ah	246.68	7	3	07h
183.72	41	16	29h	248.68	6	2	06h
185.44	40	16	28h	250.68	5	2	05h
187.17	39	15	27h	252.68	4	2	04h
188.90	38	15	26h	0.19	3	1	03h
190.65	37	15	25h	0.19	2	1	02h
192.40	36	14	24h	0.19	1	0	01h
194.16	35	14	23h	0.19	0	0	00h

Macro Channel Assignments

Table A-5 below lists the macro channel assignments as of the time this manual went to print (November 1997). *This information is preliminary and subject to change*. A *macro* is predefined set of constructs you can use when programming a scene. You do not have to use macros in your scene, but using them can save you time.

The DMX channel numbers you use to access macros are listed below:

- **Technobeam full protocol:** 17
- **Technoray full protocol:** 13
- **Technopro protocol:** 11

Table A-5. Macro DMX Channel Assignments

Macro no.	Value (dec.)	Value (%)	Value (hex)				
off	0 - 7 120 - 255	0 - 3 47 - 100	00h - 07h 78h - FFh	21	88 - 91	35	58h - 5Bh
1	8 - 11	4	08h - 0Bh	22	92 - 95	36 - 37	5Ch - 5Fh
2	12 - 15	5	0Ch - 0Fh	23	96 - 99	38	60h - 63h
3	16 - 19	6 - 7	10h - 13h	24	100 - 103	39 - 40	64h - 67h
4	20 - 23	8 - 9	14h - 17h	25	104 - 107	41	68h - 6Bh
5	24 - 27	10	18h - 1Bh	26	108 - 111	42 - 43	6Ch - 6Fh
6	28 - 31	11 - 12	1Ch - 1Fh	27	112 - 115	44 - 45	70h - 73h
7	32 - 35	13	20h - 23h	28	116 - 119	46	74h - 77h
8	36 - 39	14 - 15	24h - 27h				
9	40 - 43	16	28h - 2Bh				
10	44 - 47	17 - 18	2Ch - 2Fh				
11	48 - 51	19 - 20	30h - 33h				
12	52 - 55	21	34h - 37h				
13	56 - 59	22 - 23	38h - 3Bh				
14	60 - 63	24	3Ch - 3Fh				
15	64 - 67	25 - 26	40h - 43h				
16	68 - 71	27	44h - 47h				
17	72 - 75	28 - 29	48h - 4Bh				
18	76 - 79	30	4Ch - 4Fh				
19	80 - 83	31 - 32	50h - 53h				
20	84 - 87	33 - 34	54h - 57h				

Fixture Number to DMX Start Channel

Table A-6 below shows the conversion between fixture number and DMX start channel. You must understand and use this information if you choose to control Technobeam, Technopro and Technoray fixtures using fixture numbering.

Table A-6. Fixture Number to DMX Start Channel Conversion

Fixt. no. 1—28	18-ch. (TB F)	14-ch. (TB R, TR F)	12-ch. (TR R, TPRO)	Fixt. no. 29—43	14-ch.	12-ch.
	DMX start channel			DMX start channel		
1	1	1	1	29	393	337
2	19	15	13	30	407	349
3	37	29	25	31	421	361
4	55	43	37	32	435	373
5	73	57	49	33*	449	385
6	91	71	61	34*	463	397
7	109	85	73	35*	477	409
8	127	99	85	36*	491	421
9	145	113	97	37*		433
10	163	127	109	38*		445
11	181	141	121	39*		457
12	199	155	133	40*		469
13	217	169	145	41*		481
14	235	183	157	42*		493
15	253	197	169			
16	271	211	181			
17	289	225	193			
18	307	239	205			
19	325	253	217			
20	343	267	229			
21	361	281	241			
22	379	295	253			
23	397	309	265			
24	415	323	277			
25	433	337	289			
26	451	351	301			
27	469	365	313			
28	487	379	325			

* - A link with more than 32 fixtures requires a serial data distributor to regenerate and retime the signal.

Maximum number of fixtures per link:

18-channel protocol: 28
14-channel protocol: 36
12-channel protocol: 42

Appendix B
Factory-Installed Wheels

This appendix shows how the litho wheel, rotating litho wheel, color wheel and effects wheels are configured by the factory when Technobeam, Technoray and Technopro are shipped. The numbers shown around the outside of the wheels are the position numbers used by a controller to select that effect. For example, choosing position 6 on the Technobeam rotating litho wheel (shown in Figure B-1 below) with a controller selects the "Rip Wheel" litho.

Technobeam™ Wheels

Technobeam rotating litho wheel:

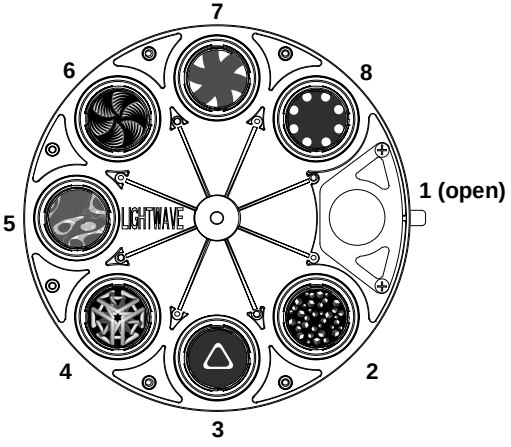

Figure B-1. Factory configuration of the Technobeam rotating litho wheel.

Position	Litho Name	Position	Litho Name
2	3-D blocks	6	Rip wheel
3	Round triangle	7	Technowedges
4	Silcsquare	8	Gatlin
5	TB-lumoil (2 lithos, one rotating, one stationary)		

Technobeam and Technoray color wheel:

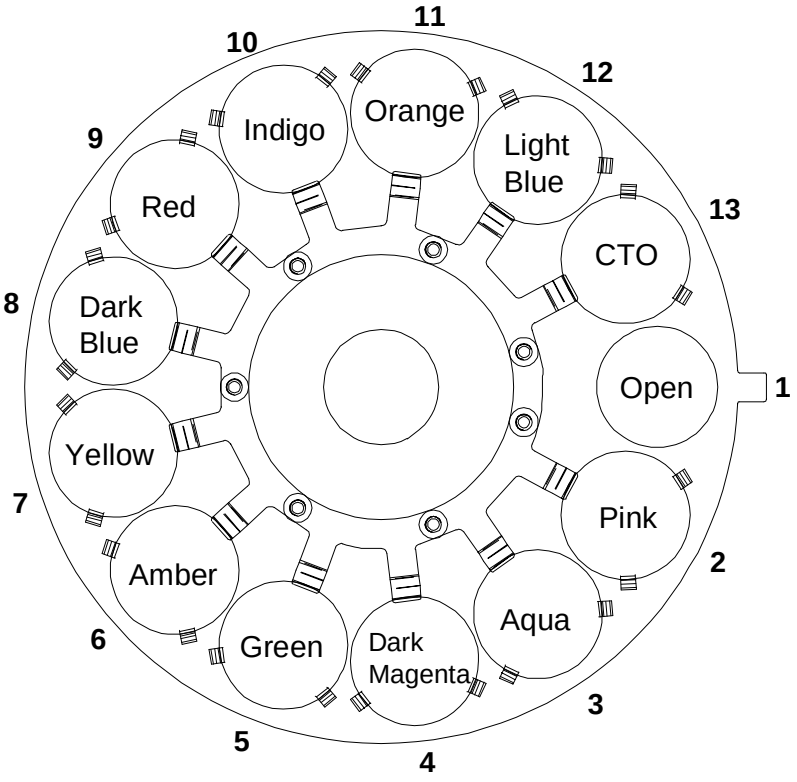

Figure B-2. Factory configuration of the Technobeam and Techonray color wheel.

Technobeam rotating effects wheel:

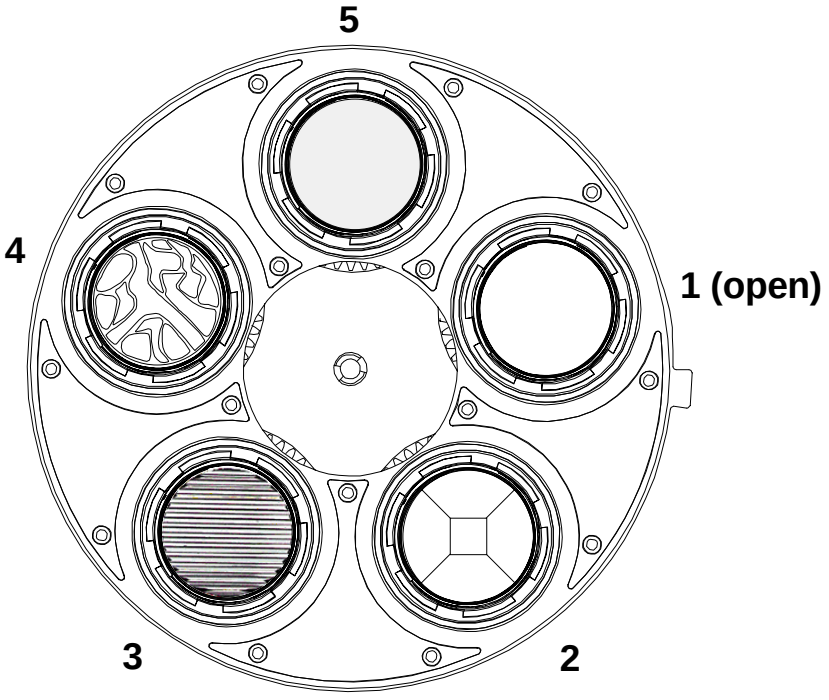

Figure B-3. Factory configuration of the Technobeam rotating effects wheel.

Position	Effect Name
2	Prism
3	Lenticular
4	Slow glass
5	Frost

Technoray rotating litho wheel:

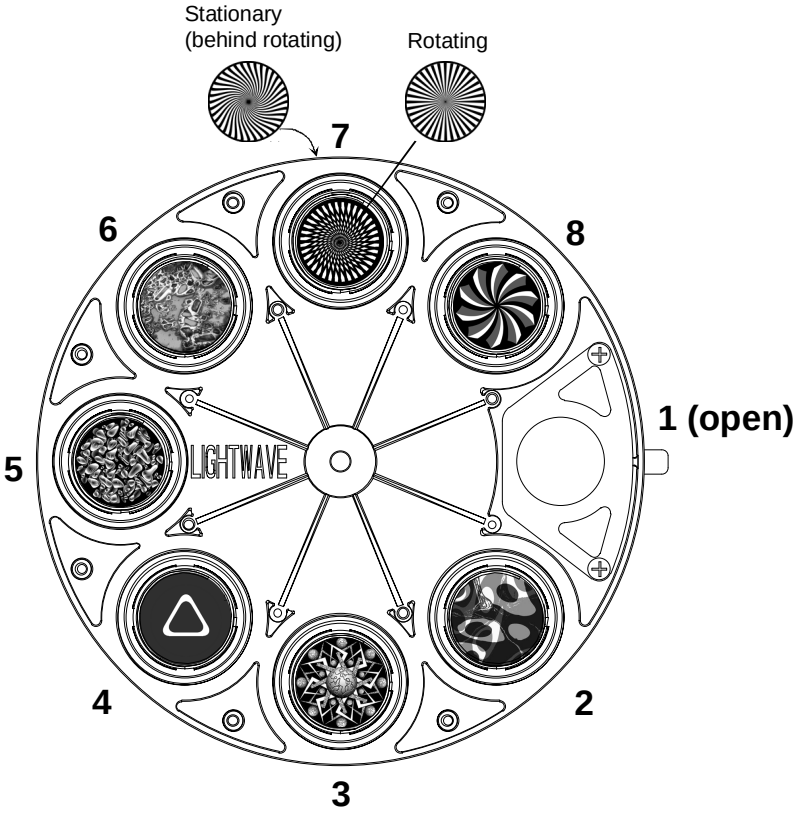

Figure B-4. Factory configuration of the Technoray rotating litho wheel.

Position	Litho Name	Position	Litho Name
2	TR-lumoil†	6	Small chip Fusion Fire®
3	Structure	7	Moire swirl†
4	Round triangle	8	Iris twist
5	Warp		

† - Both of these are combinations of two lithos: one rotating, one stationary.

Technoray color wheel: same as the Technobeam color wheel, shown in Figure B-2 on page B-2.

Technoray rotating effects wheel:

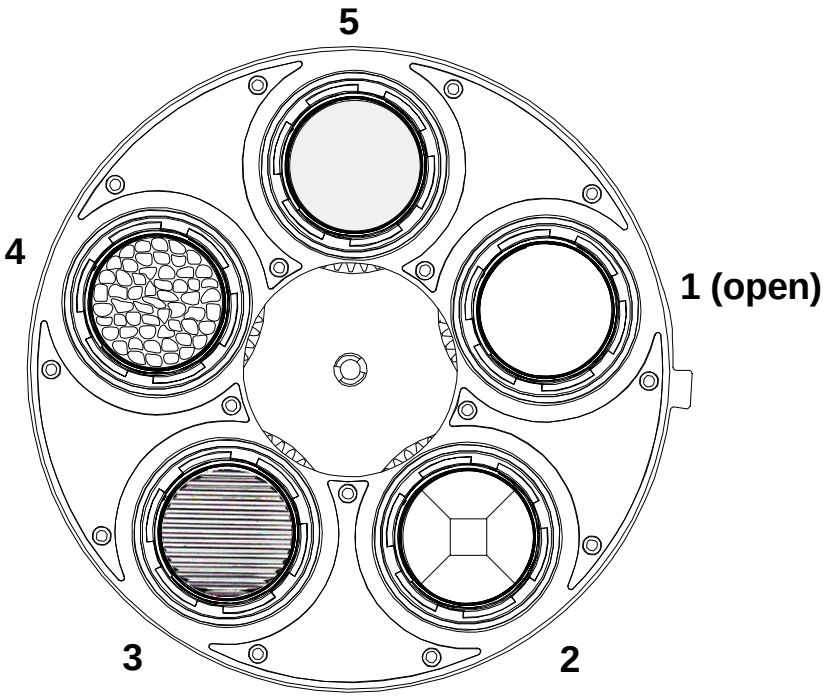

Figure B-5. Factory configuration of the Technoray rotating effects wheel.

Position	Effect Name
2	Prism
3	Lenticular
4	Hammered
5	Frost

Technopro color wheel 1:

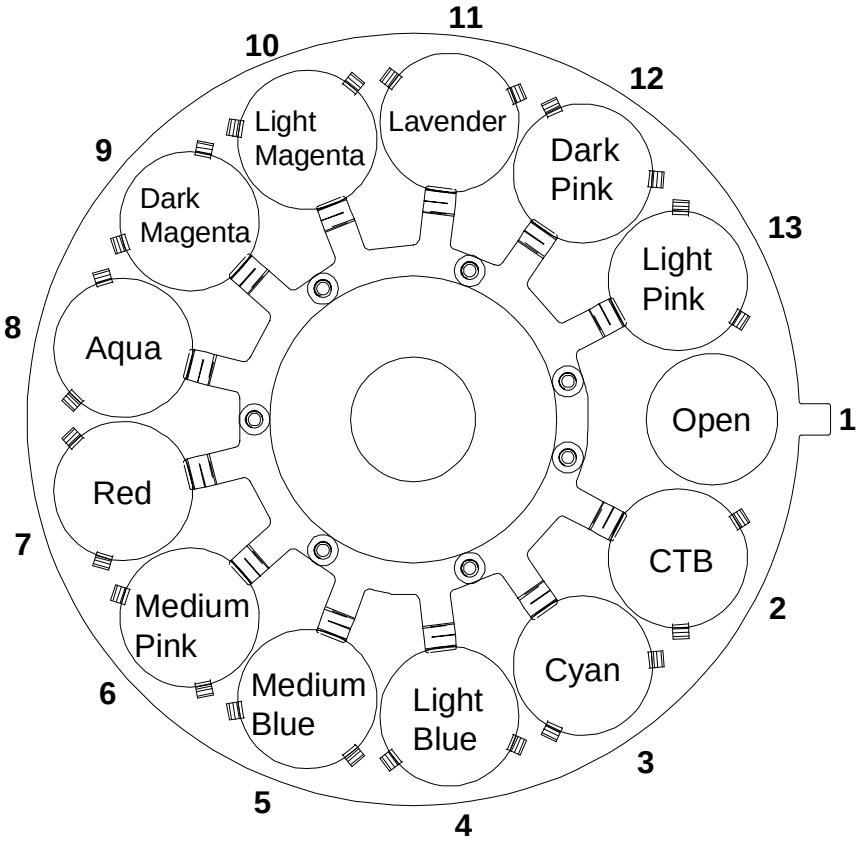

Figure B-6. Factory configuration of the 13-position Technopro color wheel.

Note CTB means *color temperature blue* and is used on tungsten-filament fixtures (such as Trackspot®) to color-correct tungsten color temperature (3200K) to daylight (5600K). On Technopro (which uses a lamp with stable operation at 6500K), this filter is included to give you a very light blue.

Technopro color wheel 2 (mixing wheel):

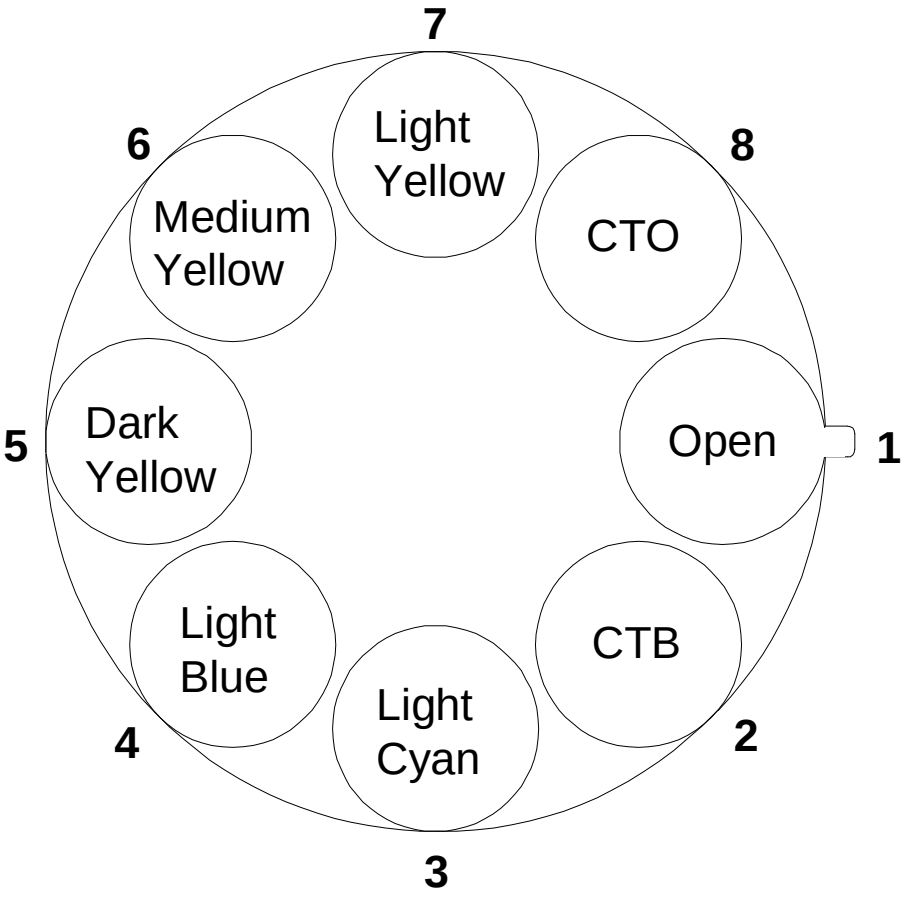

Figure B-7. Factory configuration of the Technopro 8-position color wheel (color mixing wheel).

Technopro rotating effects wheel:

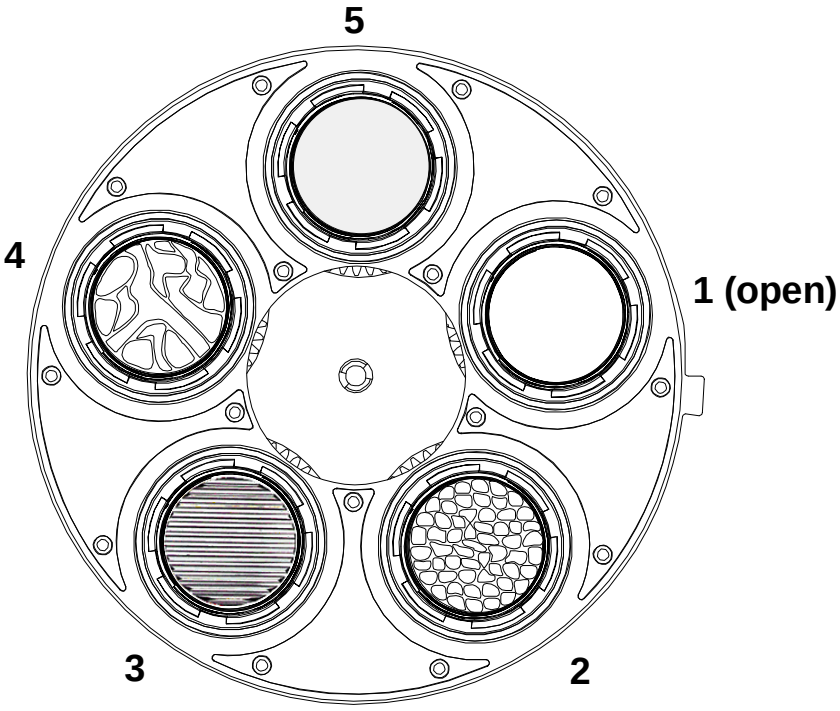

Figure B-8. Factory configuration of the Technopro rotating effects wheel.

Position	Effect Name
2	Hammered
3	Lenticular
4	Slow glass
5	Frost

Appendix C
Technopro™ Color Selection

This Appendix shows how to use Technopro to display either a continuous spectrum from blue to red, or Rosco® or Lee® gel colors.

Table C-1 shows the possible color combinations arranged from blue to red. Each color is listed from lightest to most saturated. Because judgment of color is subjective, because lamp throughput can vary, and because your expectations might be different, you should try some of the color combinations before using them in a show.

Table C-2 on page C-3 shows Rosco/Lee gel colors; you can use this information to mix Technopros with conventional lights.

Table C-1. Technopro Color Spectrum

Color	Color wheel 1 position	Color wheel 2 position	Color	Color wheel 1 position	Color wheel 2 position
Blue - *very light*	1	2	Blue - *saturated*	12	4
	2	1		6	4
	2	2		5	8
	13	3		10	4
	6	3	Purple	9	3 or 4
cyan	1	3		13	4
	12	3	Green - *pale*	3	5
	3	8		8	6
	3	1		8	1
	3	2 or 3		8	8
	2	3		8	2 or 3
medium	3	4		8	4
	4	1, 2, 3 or 4	*medium*	4	7
	1 or 2	4		8	7
	4	8		4	6
	11	3	Green-yellow	3	7
saturated	11	4		3	6
	5	1, 2, 3 or 4		10	3

Table C-1. Technopro Color Spectrum

Color	Color wheel 1 position	Color wheel 2 position	Color	Color wheel 1 position	Color wheel 2 position
Yellow - *light*	1	7	Red - *saturated*	7	1
	2	7		7	2
medium	2	6		10	5, 6 or 7
	1	6		9	5, 6 or 7
saturated	2	5		7	5, 6, 7 or 8
	1	5			
Yellow-orange	13	5, 6 or 7			
Orange - *very light*	1	8 (CTO)			
	6	6 or 7			
light	6	5			
	12	5, 6 or 7			
saturated	11	5, 6 or 7			
Pink - *very light*	13	1 or 2			
	13	8			
light	6	8			
	6	1			
	6	2			
	11	2			
	12	2			
lavender	11	1			
medium	12	8			
	11	8			
saturated	10	1 or 2			
	9	8			
magenta	9	1			
	10	8			

Table C-2 shows color wheel combinations you can use to approximate Rosco or Lee gel colors. An *L* preceding a color number means it is a Lee gel; *LHT* means Lee high-temperature gel; and an *R* preceding a color number means it is a Rosco gel.

Table C-2. Rosco/Lee Gel Approximations

Color Name	Color No.	Technopro color wheel 1 position	Technopro color wheel 2 position
Medium Yellow	L010	12	5
Medium Amber	L020	11	6
Gold Amber	L021	10	5
Scarlet	L024	7	6
Dark Magenta	L046	7	6
Deep Amber	L104	11	6
Orange	L105	10	5
Magenta	L113	7	6
Light Blue	L118	8	2
Mauve	L126	10	8
Medium Blue	L132	4	4
Primary Green	LHT139	4	5
Deep Orange	L158	10	5
Chrome Orange	L179	11	6
Dark Lavender	L180	11	3
Bermuda Blue	R376	3	1
Light Sky Blue	R67	3	2
Sky Blue	R68	4	4
Nile Blue	R70	3	8
Sea Blue	R71	3	1
Azure Blue	R72	3	1
Light Green Blue	R76	8	4
Green Blue	R77	5	8
Primary Blue	R80	5	2
Urban Blue	R81	5	1

Appendix D Important Safety Information

English Version

Warning: For Continued Protection Against Fire

1. This equipment is designed for use with Phillips M Series 250 watt, GX9.5 base metal halide lamp only. Use of any other type lamp may be hazardous and may void the warranty.
2. Do not mount on a flammable surface.
3. Maintain minimum distance of 1.0 meter (3.28 feet) from combustible materials.
4. Replace fuses only with the specified type and rating.
5. Observe minimum distance to lighted objects of 1.0 meter (3.28 feet).
6. This equipment for connection to branch circuit having a maximum overload protection of 20 A.

Warning: For Continued Protection Against Electric Shock

1. If this equipment was received without a line cord plug, attach the appropriate line cord plug according to the following code:
    - brown–live
    - blue–neutral
    - green/yellow–earth
2. As the colours of the cores in the mains lead of this equipment may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows:
    - the core which is coloured green and yellow must be connected to the terminal in the plug which is marked with the letter E or by the earth symbol ⏚, or coloured green or green and yellow.
    - the core which is coloured blue must be connected to the terminal which is marked with the letter N or coloured black.
    - the core which is coloured brown must be connected to the terminal which is marked with the letter L or coloured red.
3. Class I equipment. This equipment must be earthed.
4. Disconnect power before re-lamping or servicing.
5. Equipment suitable for dry locations only. Do not expose this equipment to rain or moisture.
6. Refer servicing to qualified personnel; no user serviceable parts inside.

Warning: For Continued Protection Against Exposure To Excessive Ultraviolet (UV) Radiation

1. Do not operate this equipment without complete lamp enclosure in place or if shields, lenses, or ultraviolet screens are damaged.
2. Change shields, lenses, or ultraviolet screens if they have become visibly damaged to such an extent that their effectiveness is impaired, for example by cracks or deep scratches.
3. Never look directly at the lamp while lamp is on.

Warning: For Continued Protection Against Injury To Persons

1. Use secondary safety cable when mounting this fixture.
2. Caution: hot lamp may be an explosion hazard. Do not open for 5 minutes after switching off. Wear eye and hand protection when re-lamping.
3. Equipment surfaces may reach temperatures up to 140 degrees C (284 degrees F). Allow 5 minutes for cooling before handling.
4. Change the lamp if it becomes damaged or thermally deformed.

Appendice D IMPORTANT: INFORMATIONS DE SÉCURITÉ

Mise en garde: pour une protection permanente contre les incendies

1. Cet appareil est conçu uniquement pour une lampe métallique à halogène Philips série M, de 700 watts, à base G22. Son utilisation avec tout autre type de lampe peut être dangereuse et annuler la garantie.
2. Ne pas monter les lampes sur une surface inflammable.
3. Maintenir à une distance minimum de 1.0 mètre de matières inflammables.
4. Ne remplacer les fusibles qu'avec des modèles et valeurs assignées recommandés.
5. Respecter une distance minimum de 1.0 mètre par rapport aux objets éclairés.
6. Cet appareil de connection au circuit comporte une protection contre les surcharges de 20 A.

Mise en garde: pour une protection permanente contre les chocs électriques

1. Si cet équipement est livré sans prise de cable, veuillez connecter la prise de cable correcte selon le code suivant:
    - marron - phase
    - bleu - neutre
    - vert/jaune - terre
2. Débrancher le courant avant de changer les lampes ou d'effectuer des réparations.
3. Cet équipement doit être uniquement utilisé dans des endroits secs. Ne pas l'exposer à la pluie ou l'humidité.
4. À l'intérieur de l'équipement il n'y a pas de pièces remplaçables par l' utilisateur. Confiez l'entretien à un personnel qualifié.
5. Equipement de Classe I. Cet équipement doit être mis à la terre.

Mise en garde: pour une protection permanente contre des expositions excessives aux rayons ultra violets (UV)

1. Ne pas utiliser cet appareil si le boîtier de la lampe n'est pas complètement fixé ou si les blindages, lentilles, ou écrans ultraviolets sont endommagés.
2. Changer les blindages ou les écrans ultraviolets s'ils sont visiblement endommagés au point que leur efficacité aient été altérée, par exemple par des fissures ou de profondes égratignures.
3. Ne jamais regarder directement la lampe quand celle ci est allumée.

Mise en garde: pour une protection permanente contre les blessures corporelles

1. Lors de l'assemblage, utiliser un câble de sécurité secondaire.
2. AVERTISSEMENT: les lampes chaudes comportent un risque d'explosion. Après l'avoir éteinte, attendre 5 minutes avant de la dégager. Lors du remplacement de la lampe, une protection des yeux et des mains est requise.
3. Les surfaces de l'appareil peuvent atteindre des températures de 140 C. Laisser refroidir pendant 5 minutes avant la manipulation.
4. Changer la lampe si elle est endommagée ou thermiquement déformée.

Anhang D
Wichtige Hinweise Für Ihre Sicherheit

WARNUNG: ZUM SCHUTZ VOR BRANDGEFAHR

1. Dieses Gerät ist nur für den Gebrauch mit einer 700-Watt, Philips Serie M, Metall-Halogen-Lampe mit G22-Sockel konzipiert. Der Gebrauch irgend eines anderen Lampentyps könnte Sie gefährden und Ihre Garantie außer Kraft setzen.
2. Das Gerät nie auf einer feuergefährlichen Fläche montieren.
3. Stets einen Mindestabstand von 1 Meter zu brennbaren Materialien einhalten.
4. Zum Ersatz nur Sicherungen verwenden, die dem vorgeschriebenen Typ und Nennwert entsprechen.
5. Einen Mindestabstand von 1 Meter zu den angestrahlten Objekten einhalten.
6. Dieses Gerät darf nur an eine Zweigleitung mit einem Überlastungsschutz von höchstens 20 A angeschlossen werden.

WARNUNG: ZUM SCHUTZ GEGEN GEFÄHRLICHE KÖRPERSTRÖME

1. Wenn dieses Gerät ohne einen Netzkabelstecker erhalten wurde, ist der entsprechende Netzkabelstecker entsprenchend dem folgenden Code anzubringen:
    - Braun - Unter Spannung stehend
    - Blau - Neutral
    - Grün/Gelb - Erde
2. Vor dem Austauschen von Lampen oder vor Wartungsarbeiten stets den Netzstecker ziehen.
3. Diese Geräte sind nur zum Einbau in trockenen Lagen bestimmt und müssen vor Regen und Feuchtigkeit geschützt werden.
4. Servicearbeiten sollten nur von Fachpersonal ausgeführt werden. Das Gerät enthält keine wartungsbedürftigen Teile.
5. Dieses Gerät gehört zur Klasse I. Dieses Gerät muß geerdet werden.

WARNUNG: ZUM SCHUTZ GEGEN ÜBERMÄSSIGE ULTRAVIOLETT (UV)-BESTRAHLUNG

1. Benutzen Sie dieses Gerät nur, wenn das komplette Lampengehäuse fest eingebaut ist; ebenfalls dürfen keine der Schutzabdeckungen, Linsen oder der UV-Schutz Beschädigungen aufweisen.
2. Die Schutzabdeckungen, Linsen und der UV-Schutz müssen ausgewechselt werden, wenn sie sichtlich dermaßen beschädigt sind, daß sie ihre Wirksamkeit einbüßen, z.B. infolge von Rissen oder tiefen Kratzern.
3. Nie direkt in die eingeschaltete Lampe schauen.

WARNUNG: ZUM SCHUTZ VOR VERLETZUNGEN

1. Verwenden Sie bei der Installation des Beleuchtungskörpers ein zusätzliches Sicherheitskabel.
2. VORSICHT: Bei einer heiße Lampe besteht Explosionsgefahr. Nach dem Abschalten der Netzspannung sollten Sie etwa 5 Minuten warten, bevor Sie das Lampengehäuse öffnen. Schützen Sie beim Auswechseln der Lampen Ihre Hände und tragen Sie eine Schutzbrille.
3. Die Oberflächen des Gerätes können Temperaturen bis zu 65 C erreichen. Vor dem Anfassen stets 5 Minuten lang abkühlen lassen.
4. Falls die Lampe beschädigt oder durch Wärmeeinwirkung verformt ist, muß sie ausgewechselt werden.

Appendice D
Importanti Informazioni Di Sicurezza

AVVERTENZA: PER PREVENIRE INCENDI:

1. Questa apparecchiatura è stata progettata per l'uso esclusivo con lampada a sali metallici Philips da 700 watt, base G22, serie M. L'uso di qualsiasi altro tipo di lampada può essere pericoloso e può annullare la garanzia.
2. Da non montare sopra una superficie infiammabile.
3. Mantenere l' apparecchio a un minimo di 1.0 metri (3.28 piedi) di distanza dai materiali combustibili.
4. Rimpiazare i fusibili usando soltanto quelli del tipo e della taratura adatta.
5. Mantenere una distanza minima di 1.0 metri (3.28 piedi) dagli oggetti accesi.
6. Questa apparecchiatura e' da collegarsi ad un circuito con una protezzione da sovraccarico massima di 20 amperes.

AVVERTENZA: PER PREVENIRE LE SCOSSE ELETTRICHE:

1. Se questa apparecchiatura è stata consegnata senza una spina del cavo di alimentazione, collegare la spina appropriata del cavo di alimentazione in base ai seguenti codici:
    - marrone - sotto tensione
    - blu - neutro
    - verde/giallo - terra
2. Disinnestare la corrente prima di cambiare la lampadina o prima di eseguire qualsiasi riparazione.
3. Questa apparecchiatura e' da usarsi in ambienti secchi. Non e' da essere esposta ne alla pioggia ne all' umidita'.

4. Per qualsiasi riparazione rivolgersi al personale specializzato. L' utente non deve riparare nessuna parte dentro l' unita'.
5. Aparecchio di Classe I. Questa apparecchiatura deve essere messa a terra.

AVVERTENZA: PER PROTEGGERSI CONTRO LE RADIAZIONI DEI RAGGI ULTRAVIOLETTI:

Non usare questa apparecchiatura se il sistema di chiusura della lampadina non e' completo o se gli scudetti, le lenti, o gli schermi ultravioletti si sono visibilmente danneggiati di maniera tale che la loro efficacia sia stata ridotta --- ad esempio, se vi sono visibili spaccature o graffi profondi. Mai guardare direttamente verso la lampadina quando sia accesa.

AVVERTENZA: PER NON FERIRE AD ALTRE PERSONE:

1. Al montare questa apparechiatura, usare un secondo cavo di sicurezza.
2. Avvertenza: la lampadina calda potrebbe esplodere. Spegnerla per 5 minuti prima di aprirla. Usare protezzioni per le mani e per gli occhi prima di cambiare la lampadina.
3. Le superfici della apparecchiatura possono arrivare a temperature di 65 gradi centrigradi (149 gradi f). Aspettare 5 minuti prima di maneggiare.
4. Cambiare la lampadina se si danneggia o se si e' deformata dovuto alle alte temperature.

Apéndice D
Información Importante De Seguridad

ADVERTENCIA: PARA PROTECCIÓN CONTINUA CONTRA INCENDIOS:

1. Este equipo está diseñado para utilizarse únicamente con la lámpara de haluro metálico Philips serie M, de 700 vatios y base G22. El uso de cualquier otro tipo de lámpara puede resultar peligroso, pudiendo anular la garantía.
2. No monte el equipo sobre una superficie inflamable.
3. Mantenga una distancia mínima de materiales combustibles de 1.0 metro.
4. Cambie los fusibles únicamente por otros que sean del tipo y la clasificación especificadas.
5. Conserve una distancia mínima a objetos iluminados de 1.0 metro.
6. Este equipo debe conectarse a un circuito que tenga una protección máxima contra las sobrecargas de 20 A.

ADVERTENCIA: PARA LA PROTECCIÓN CONTINUA CONTRA ELECTROCUCIONES

1. Si se recibió este equipo sin el enchufe de alimentacion, monte usted el enchufe correcto según el clave siguente:
    - moreno - vivo
    - azul - neutral
    - verde/amarillo - tierra.
2. Desconecte el suministro de energía antes de recambiar lámparas o prestar servicio de reparación.
3. Este equipo se adecua a lugares secos solamente. no lo exponga a la lluvia o humedad.
4. Derive el servicio de reparación de este equipo al personal calificado. el interior no contiene repuestos que puedan ser reparados por el usuario.
5. Equipo de Clase I. Este equipo debe conectarse a la tierra.

ADVERTENCIA: PARA PROTECCIÓN CONTINUA CONTRA LA EXPOSICIÓN A RADIACIÓN ULTRAVIOLETA (UV) EXCESIVA

1. No opere este equipo sin tener colocada en su lugar la caja protectora completa de la lámpara o bien, si el blindaje , los lentes o las pantallas ultravioletas están dañadas.
2. Cambie el blindaje, los lentes o las pantallas ultravioleta si nota una avería visible, a tal grado que su eficacia se vea comprometida. Por ejemplo, en el caso de grietas o rayaduras profundas.
3. Jamás mire directamente a la lámpara en tanto ésta esté encendida.

ADVERTENCIA: PARA PROTECCIÓN CONTINUA CONTRA LESIONES CORPORALES

1. Use cable secundario de seguridad al montar este aparato.
2. Precaución: una lámpara caliente puede constituir un peligro de explosión. No la abra por 5 minutos luego de haberla apagado. Lleve puestos, un protector ocular, y guantes al recambiar lámparas.
3. Las superficies del equipo pueden alcanzar temperaturas máximas de 65 grados centígrados. Deje que se enfríen por 5 minutos antes de tocarlas.
4. Cambie la lámpara si ésta se avería o deforma por acción térmica.

Vigtig Sikkerhedsinformation - DANMARK

Advarsel: Beskyttelse mod elektrisk chock.

Vigtigt!

Lederen med gul/groen isolation maa kun tilsluttes en klemme maerket

eller